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JUNE 2001

NATIONAL GEOGRAPHIC

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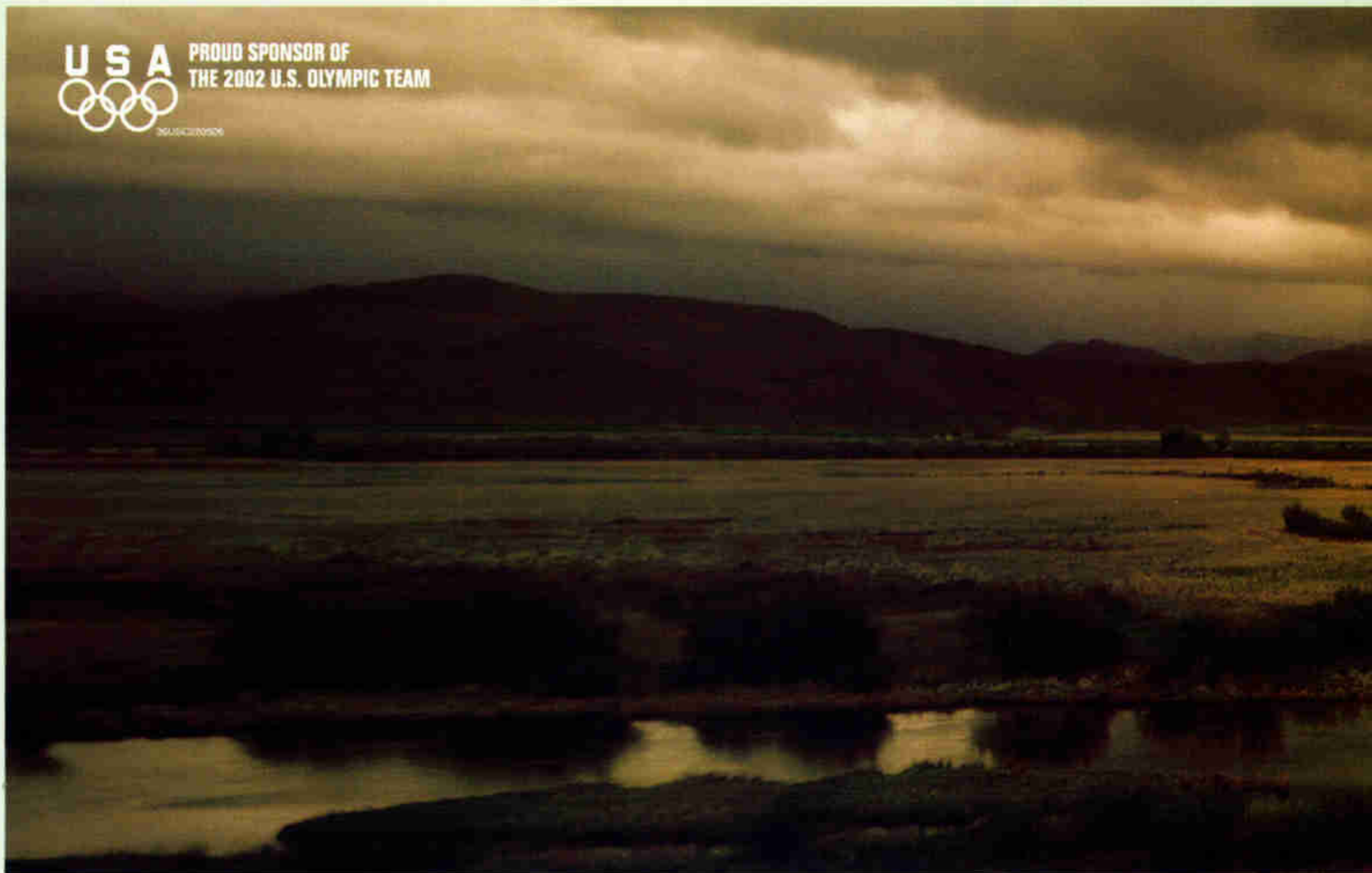
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Cary, North Carolina's
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Asia's Last

LIONS

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WILDLIFE AS CANON SEES IT

A nocturnal garden dormouse peeks out from leafy cover, revealing its prominent ears and black mask. Arboreal in some regions, the skillful climber scurries about looking for fruit, nuts, insects and small vertebrates. This diet may change to mainly fruit in the fall in preparation for a long hibernation. The dormouse vocalizes often, and in spring the female whistles to attract a mate. Using grass and leaves she builds a globular nest in a hollow or crook of a branch, and soon thereafter gives birth to one litter of four to six. The garden dormouse has become rare in much of its

range and has disappeared in some areas due to destruction and fragmentation of forest habitat.

As a global corporation committed to social and environmental concerns, we join in worldwide efforts to promote greater awareness of endangered species for the benefit of future generations.



Garden Dormouse (*Eliomys quercinus*)
Size: Head and body length, 10-17 cm; tail, 9-13 cm
Weight: 45-120 g; increases before hibernation to over 200 g
Habitat: Occurs mainly in deciduous and pine forests in Europe
Surviving number: Unknown; populations have declined in recent decades



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THE COVER

A lioness and her three-month-old cub nestle on the floor of the Gir Forest in western India.
PHOTOGRAPH BY MATTIAS KLUM

MORE INFORMATION

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**IMAGINE IF YOU COULD PLAN YOUR DAY AROUND YOUR
LIFE INSTEAD OF YOUR ARTHRITIS PAIN.**



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VIOXX IS HERE. 24-HOUR RELIEF FOR THE MOST COMMON TYPE OF ARTHRITIS PAIN, OSTEOARTHRITIS.

It isn't about winning a marathon.
Or making you feel like a kid again.
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TAKE WITH OR WITHOUT FOOD.

VIOXX doesn't need to be taken with food. So, you don't have to worry about scheduling VIOXX around meals.

IMPORTANT INFORMATION ABOUT VIOXX.

In rare cases, serious stomach problems, such as bleeding, can occur without warning. People with allergic reactions, such as asthma, to aspirin or other arthritis medicines should not take VIOXX.

Tell your doctor if you have liver or kidney problems, or are pregnant. Also, VIOXX should not be used by women in late pregnancy.

VIOXX has been extensively studied in large clinical trials. Commonly reported side effects included upper respiratory infection, diarrhea, nausea and high blood pressure. Report any unusual symptoms to your doctor.

ASK YOUR DOCTOR OR HEALTHCARE PROFESSIONAL ABOUT VIOXX.

Call 1-800-859-5993 for more information, or visit www.vioxx.com. Please see important additional information on the next page.

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Generic name: rofecoxib ("ro-fa-COX-ib")**

9183902

You should read this information before you start taking VIOXX*. Also, read the leaflet each time you refill your prescription, in case any information has changed. This leaflet provides only a summary of certain information about VIOXX. Your doctor or pharmacist can give you an additional leaflet that is written for health professionals that contains more complete information. This leaflet does not take the place of careful discussions with your doctor. You and your doctor should discuss VIOXX when you start taking your medicine and at regular checkups.

What is VIOXX?

VIOXX is a nonsteroidal anti-inflammatory drug (NSAID) that is used to reduce pain and inflammation (swelling and soreness). VIOXX is available as a tablet or a liquid that you take by mouth.

VIOXX is a medicine for:

- relief of osteoarthritis (the arthritis caused by age-related "wear and tear" on bones and joints)
- management of acute pain in adults (like the short-term pain you can get after a dental or surgical operation)
- treatment of menstrual pain (pain during women's monthly periods).

Who should not take VIOXX?

Do not take VIOXX if you:

- have had an allergic reaction such as asthma attacks, hives, or swelling of the throat and face to aspirin or other NSAIDs (for example, ibuprofen and naproxen).
- have had an allergic reaction to rofecoxib, which is the active ingredient of VIOXX, or to any of its inactive ingredients. (See Inactive Ingredients at the end of this leaflet.)

What should I tell my doctor before and during treatment with VIOXX?

Tell your doctor if you are:

- pregnant or plan to become pregnant. VIOXX should not be used in late pregnancy because it may harm the fetus.
- breast-feeding or plan to breast-feed. It is not known whether VIOXX is passed through to human breast milk and what its effects could be on a nursing child.

Tell your doctor if you have:

- kidney disease
- liver disease
- heart failure
- high blood pressure
- had an allergic reaction to aspirin or other NSAIDs
- had a serious stomach problem in the past.

Tell your doctor about:

- any other medical problems or allergies you have now or have had.
- all medicines that you are taking or plan to take, even those you can get without a prescription.

Tell your doctor if you develop:

- ulcer or bleeding symptoms (for instance, stomach burning or black stools, which are signs of possible stomach bleeding).
- unexplained weight gain or swelling of the feet and/or legs.
- skin rash or allergic reactions. If you have a severe allergic reaction, get medical help right away.

How should I take VIOXX?

VIOXX should be taken once a day. Your doctor will decide what dose of VIOXX you should take and how long you should take it. You may take VIOXX with or without food.

Can I take VIOXX with other medicines?

Tell your doctor about all of the other medicines you are taking or plan to take while you are on VIOXX, even other medicines that you can get without a prescription. Your doctor may want to check that your medicines are working properly together if you are taking other medicines such as:

- methotrexate (a medicine used to suppress the immune system)
- warfarin (a blood thinner)
- rifampin (an antibiotic)
- ACE inhibitors (medicines used for high blood pressure and heart failure)
- lithium (a medicine used to treat a certain type of depression).

What are the possible side effects of VIOXX?

Serious but rare side effects that have been reported in patients taking VIOXX and/or related medicines have included:

- Serious stomach problems, such as stomach and intestinal bleeding, can occur with or without warning symptoms. These problems, if severe, could lead to hospitalization or death. Although this happens rarely, you should watch for signs that you may have this serious side effect and tell your doctor right away.
- Serious allergic reactions including swelling of the face, lips, tongue, and/or throat which may cause difficulty breathing or swallowing occur rarely but may require treatment right away. Severe skin reactions have also been reported.
- Serious kidney problems occur rarely, including acute kidney failure and worsening of chronic kidney failure.
- Severe liver problems, including hepatitis and jaundice, occur rarely in patients taking NSAIDs, including VIOXX. Tell your doctor if you develop symptoms of liver problems. These include nausea, tiredness, itching, tenderness in the right upper abdomen, and flu-like symptoms.

In addition, the following side effects have been reported: confusion, hair loss, hallucinations, low blood cell counts, unusual headache with stiff neck (aseptic meningitis).

More common, but less serious side effects reported with VIOXX have included the following:

Upper and/or lower respiratory infection and/or inflammation
Headache
Dizziness
Diarrhea
Nausea and/or vomiting
Heartburn, stomach pain and upset
Swelling of the legs and/or feet
High blood pressure
Back pain
Tiredness
Urinary tract infection.

These side effects were reported in at least 2% of osteoarthritis patients receiving daily doses of VIOXX 12.5 mg to 25 mg in clinical studies.

The side effects described above do not include all of the side effects reported with VIOXX. Do not rely on this leaflet alone for information about side effects. Your doctor or pharmacist can discuss with you a more complete list of side effects. Any time you have a medical problem you think may be related to VIOXX, talk to your doctor.

What else can I do to help manage my osteoarthritis pain?

Talk to your doctor about:

- Exercise
- Controlling your weight
- Hot and cold treatments
- Using support devices.

What else should I know about VIOXX?

This leaflet provides a summary of certain information about VIOXX. If you have any questions or concerns about VIOXX, osteoarthritis or pain, talk to your health professional. Your pharmacist can give you an additional leaflet that is written for health professionals.

Do not share VIOXX with anyone else; it was prescribed only for you. It should be taken only for the condition for which it was prescribed.

Keep VIOXX and all medicines out of the reach of children.

Inactive Ingredients:

Oral suspension: citric acid (monohydrate), sodium citrate (dihydrate), sorbitol solution, strawberry flavor, xanthan gum, sodium methylparaben, sodium propylparaben.

Tablets: croscarmellose sodium, hydroxypropyl cellulose, lactose, magnesium stearate, microcrystalline cellulose, and yellow ferric oxide.

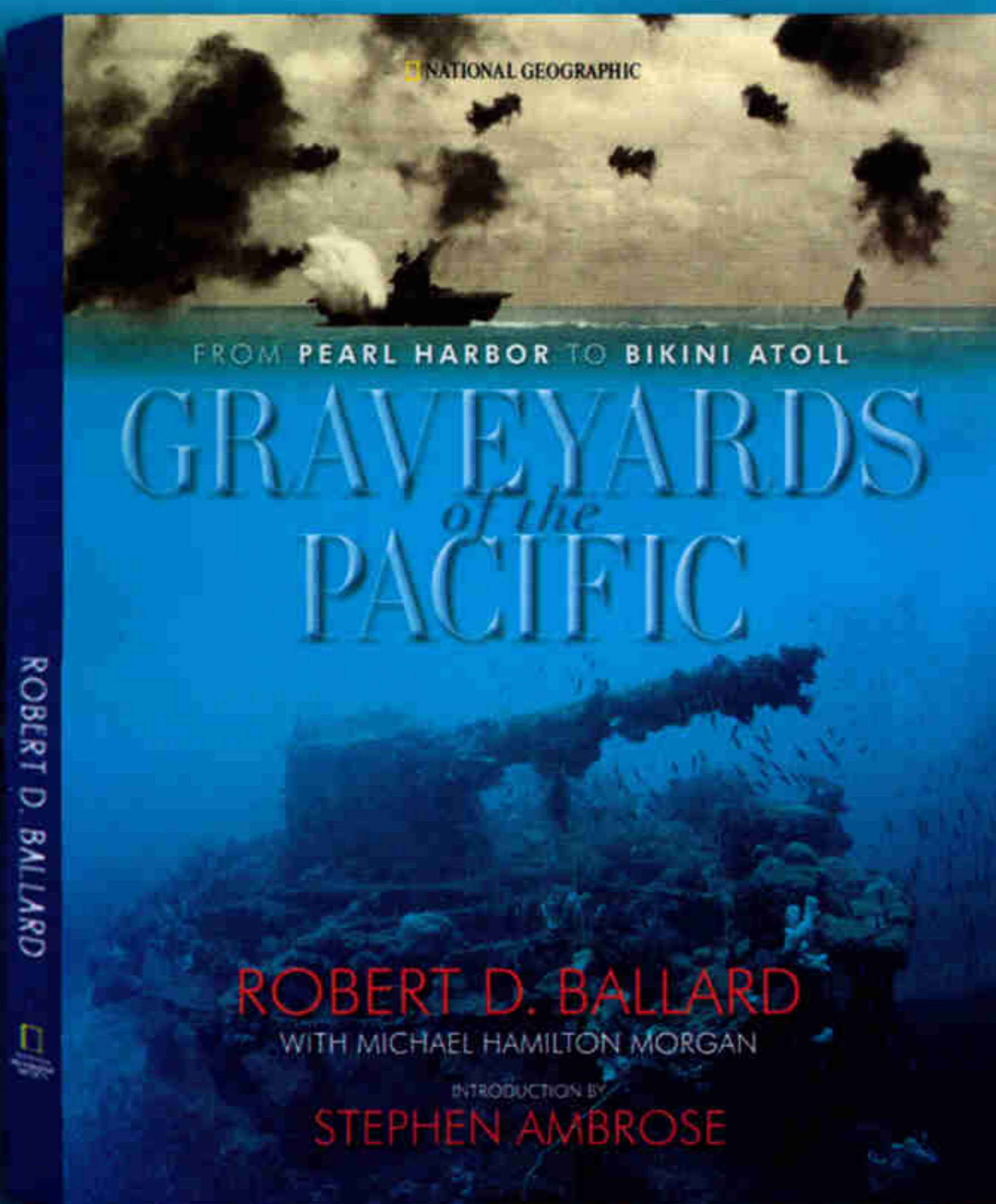
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MICHAEL YAMASHITA

“Mar-co!” comes the singsong call. “Po-lo!” comes the response, followed by a splashing lunge in the water-tag game debuting once again this summer in swimming pools all across the country and indeed around the world. How history’s most famous traveler became a children’s pastime is something of a mystery (if you have the answer, please let us know). Assistant Editor Mike Edwards even reports the game being played in Iran during his and photographer Mike Yamashita’s epic assignment. For eight months over the course of four years the pair logged more than 6,000 miles on the ground, retracing the remarkable 13th-century saga of Marco Polo from Venice to China and back again. In this issue the second installment of our three-part presentation follows Marco’s 17-year sojourn in China itself, where he undoubtedly saw rural scenes like the one above on his way to the court of Kublai Khan. We’ll escort Marco home next month.

One of the greatest strengths of this magazine has always been to put meat on the bones of history, bringing to life the people and events of the past while separating fact from fiction. Was Marco Polo for real? Judge for yourself as you join him on his adventures. And while you’re at it, you might tell those kids in the pool out back to hold it down.

Bill Allen

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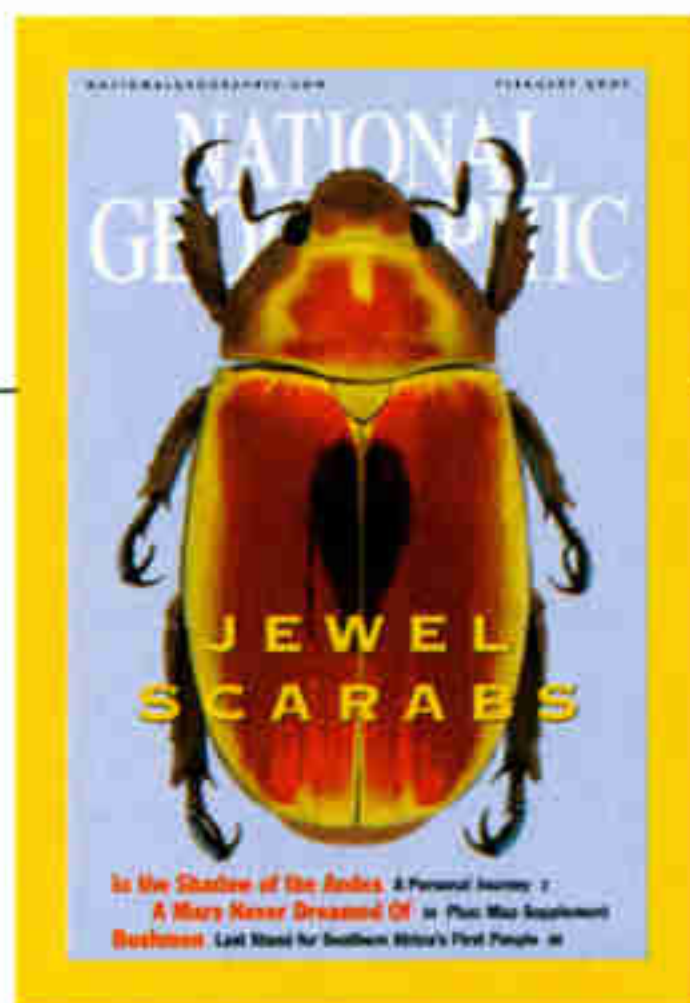


Forum

February 2001

All roads seem to lead through the Meadowlands for New Jersey natives. Some expressed praise and others strong protest about our article on the urban wetlands.

"We are an area rich in culture, rich in history, and rich with the meadows," wrote one reader. Another found the article "nothing more than a repetition of Jersey stereotypes."



New Jersey Meadowlands

Riverkeeper Bill Sheehan provides a timely reminder that the key word in Hackensack Meadowlands Development Commission is "development." The HMDC's proposed Special Area Management Plan includes destruction of about 500 acres of wetlands. This loss will be compensated by rehabilitating existing wetlands. Net loss: 500 acres.

J. F. CANTILLI
Cranford, New Jersey

I was surprised that the author did not mention the Meadowlands Environment Center. Each year this facility hosts thousands of schoolchildren in classroom and outdoor activities where they study environmental issues and natural history subjects. The center conducts workshops for teachers and offers public programs. It is a bright spot in an otherwise dismal picture of despoiled and overdeveloped wetlands.

PAULETTE ROBISCHON
Hasbrouck Heights, New Jersey

I can still remember the reaction from everyone in the car when we neared the Meadowlands on our way to New York back in the '70s—roll up the windows, switch the air-conditioning to

recycle internal air, and hope it wasn't a bad-stench day. So while preparing my five-year-old for a trip through those same swamps, I expected the worst. You can imagine my surprise when my daughter called our attention to several swans feeding in a pool. Upon further inspection we noticed a whole host of waterfowl going about their daily business. I am constantly amazed at nature's ability to heal herself if left to her own resources and not left with any of our trash.

DAVE FLAIM
Bethlehem Township, New Jersey

Andes Journey

Pablo Corral Vega's piece about the Andes is absolutely stunning. He captures the spirit of Latin America—its force and strong will. After reading his text and seeing his photographs, I sat in my North Carolina kitchen and cried, longing for my homeland. Thank you, Corral Vega.

ELIANA GUEVEIRO RAMOS
Greensboro, North Carolina

As a participant in an Elderhostel program in June 1991, I traveled with a group in Ecuador. We witnessed Pablo Corral Vega's hospitality and friendship when he and his family invited



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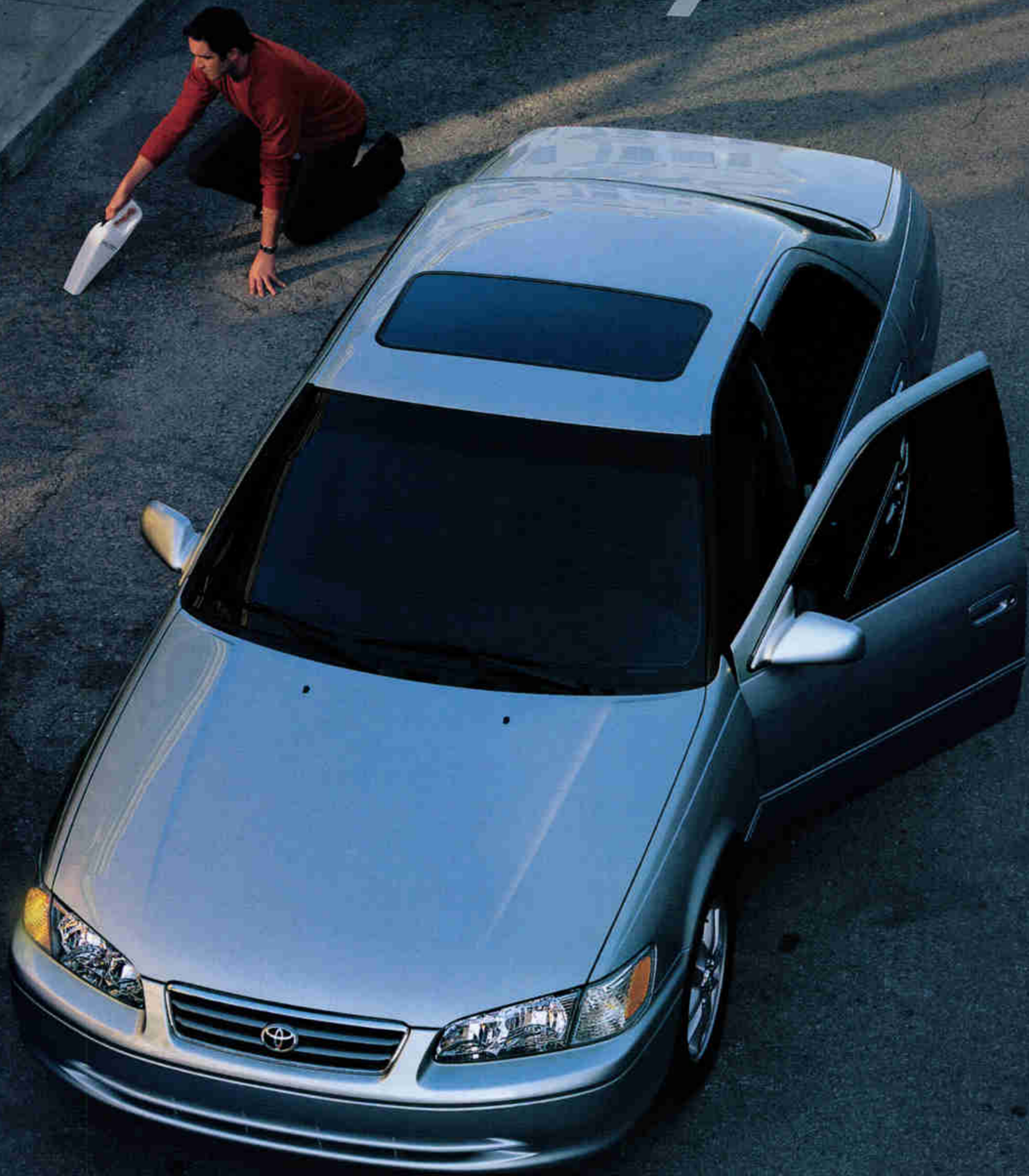
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Bushmen

As a Native American and a member of one of the First Nations of North America, I was deeply saddened by your article on the Bushmen. The history of these beautiful people has so closely paralleled that of my own people. When will the world begin to treasure its indigenous people and stop governments from encouraging this type of cultural genocide? I can only pray that the Bushmen will protect their culture and traditions before they, like so many of our North American tribes, disappear entirely.

CHERYL ADDINGTON
Portsmouth, Ohio

Teaching a course in anthropology this semester, I found

the Bushman article presents a misleading and unnecessarily grim picture of them. As a whole their population is increasing. They have succeeded in reclaiming land and rights to resources they had lost. They also have started a movement to educate their children in their language and in English. Statements like "pity the people with no name" and "mythology is one of their few assets" are insulting to people who possess a vast knowledge of their environment and an impressive social technology.

MEGAN BIESELE
Austin, Texas

As with the Australian Aborigines, Africa's Bushmen represent the worst horrors of discovery and colonization by



NGS PHOTOGRAPHER CHRIS JOHNS

Europeans. In both cases the indigenous peoples were treated as no better than vermin, and efforts were made to eradicate them when they stood in the path of the colonists. There should be a Day of Sorrow and Apology in every colonial country to remind the present of the shame of the past so that we never see its like again.

FRANK CHAI
Melbourne, Australia

us to lunch at their home. It was not only an impressive and enjoyable event, but it also gave us insight into their life and culture. He and his brother presented each of us with a copy of Corral Vega's book *Tierra Desnuda*. He showed that "hospitality, friendship . . . and the time we take to share all these things" are not just glib notions.

M. PAT TURNER
Okotoks, Alberta

I returned from Chile at the end of last January and was delighted to see your article "Andes Journey." Your picture of Paine Peak and Grey Lake

(pages 4-5) caught my attention because the peaks are lined up differently from what I had seen from the shore of the lake where I stayed. I compared your picture with some photographs I took there and even checked with a map of the area. I now suspect that the picture was printed reversed.

KENJI KITO
Sapporo, Japan

Your suspicion is correct. We regret the error.

Paintings of the Spirit

Congratulations to David Lewis-Williams and NATIONAL GEOGRAPHIC for portraying the rock art of the San as more than representational. If this is any indication of a shift in general opinion toward so-called primitive art, I for one am very glad.

WALTER ODENTHAL
Banff, Alberta

Mars

As a youth I read H. G. Wells's *War of the Worlds* and Edgar Rice Burroughs's *John Carter of Mars*. After many years of being told that Mars was a dead planet, it was exciting to find out just how dynamic the red planet is. I almost expected to see John Carter riding his Thoat across the sands of Barsoom. The more we discover of our universe, the more wonderful it becomes.

BERK SHAW
Vernon, British Columbia

Mars Map

The map of Mars is truly an amazing accomplishment. One thing that could bear further explanation, however, is how the Martian "sea level," or reference datum, was established.

LEE MEISTER
Houston, Texas

Mars's sea level was established by using altimetry and gravity data

WRITE TO FORUM

National Geographic Magazine, PO Box 98198, Washington, DC 20090-8198, or by fax to 202-828-5460, or via the Internet to ngsforum@nationalgeographic.com. Include name, address, and daytime telephone. Letters may be edited for clarity and space.

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to determine the level to which an ocean-like abundance of water would rise on this dry planet. The average water level at the equator was chosen as the zero level, and from it scientists measure features like Olympus Mons and Valles Marineris.

Update From the Field

With the world's coral dying at alarming rates, I was shocked to see Yvonne Sadovy holding on to and kneeling on coral while watching mandarinfish (page 88). As a long-time diver, I know she is killing the coral by touching it and undoubtedly breaking it with her fins. While the fish are important, she is being irresponsible by handling the coral. SCUBA 101: Do not touch the coral; it dies.

BEN STAHL

Sharpsburg, Georgia

You're right. Recreational divers should never touch coral. However, scientists must sometimes have brief, careful contact with it.

Yvonne Sadovy is resting her fins on the sand below her and steadying herself with the tips of her fingers, causing no lasting damage.

In 1993 I joined other volunteers assisting Raphael Ben-Shahar in his study of elephant habitat in Botswana. Shortly thereafter, Rafi was attacked by male elephants and badly injured. How wonderful to learn through this article that he is not only alive and well but back working with the animals that are a major part of his life.

LEAH CLEMENT

Bangor, Maine

ZipUSA: Waimanalo, Hawaii

I was disturbed to read about how a government program intended to help native Hawaiians actually segregates them from other residents and contributes to feelings of bitterness and resentment. When will we learn that only when we are all equal in the eyes of the law will we have communities where people will be free both to preserve their cultural heritage and to enjoy positive relationships with those of other heritages?

RICH BURDGE

Akron, Indiana

Jewel Scarabs

NATIONAL GEOGRAPHIC gives me an excellent perspective of the world outside, but

I see a heart
waiting to be broken



indoor light



mid light



outdoor light

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the article on jewel scarabs puts me in a position of admiring something closer—my country. I thank David Hawks and Ronald Cave for illustrating the beautiful scarabs of Honduras. It must have been an ordeal to study scarabs in a Honduran forest. I'm glad there are people who appreciate these forests and teach us about them.

EDUARDO CORRALES
Tegucigalpa, Honduras

We were extremely disappointed in the perspective presented in the "Jewel Scarabs" article. To presume you can save endangered habitat by protecting it for others to come in and collect species for display or commerce is a misguided and fallacious concept. We would rather they stay out of the forests than promote commercial trade and accumulation of these beetles. A great disservice has been done to the beetles by advertising the price for their lives.

SUSANNE HARE AND STEVE LAWSON
Tofino, British Columbia

Photographer and entomologist David Hawks replies: I can appreciate the sentiments expressed by Ms. Hare and Mr. Lawson. However, effective conservation efforts center on habitat preservation and the health of populations. Harvesting beetles at a level that cannot affect populations can be tolerated, and in fact encouraged, if it promotes habitat protection in areas where protection is not guaranteed.

Ask Us

I have a question regarding your statement that in India and Egypt "bowls of water set into the ground froze at night as a result of cooling evaporation." I'm skeptical.

BUD PARRETT
Jefferson City, Montana

This can happen, but only under certain conditions. In dry desert areas that experience wide extremes of day and night temperatures, water in specially designed containers or ponds can freeze at temperatures just above 32°F. On cloudless winter nights the water loses heat to the sky by thermal radiation and evaporation. In the absence of wind, convection of heat from the air to the water is minimized, so the heat loss through radiation and evaporation is enough to freeze the water.

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Entries for 1st drawing must be received between 12:00 a.m. ET, Jan. 1, 2001, and 11:59 p.m. ET, Jan. 31, 2001. Entries for remaining drawings must be received between 12:00 a.m. ET on the 1st day of each month and 11:59 p.m. ET of the last day of each month, from Feb. through June. To enter and/or obtain complete rules, go to www.ford.com/heroes or mail a 3"x5" card with participant's name, address and telephone number to: "Contest Administrator, Heroes for the Planet, 1730 M Street, NW, Suite 600, Washington, DC 20036, USA." VOID WHERE PROHIBITED.

about some amazing people and the vital work they're doing to make a difference for the Earth. People like Dr. Sylvia Earle, a marine biologist who's led more than 50 expeditions into the deep. Or Dr. Wade Davis, who's dedicated his life to the preservation and understanding of various cultures and indigenous peoples across the planet. Besides learning about people making a difference, you'll also get all the details about how you can enter to win the chance to join an explorer on a real expedition. For all the details, visit www.ford.com/heroes.

DID SHE CAST A SPELL ON THE FOREST?



DR. JANE GOODALL
Naturalist

As a girl, the story of *Tarzan*[®] stirred her imagination. As a young woman, she ventured into the wilds of Africa to study chimpanzees. And proceeded to lay the foundation for all future primate research. Her name is Jane Goodall. She's dedicated her life to all living things. Founded the Jane Goodall Institute, which supports programs in wildlife research, conservation, education and animal welfare. And spends her days working with young people around the globe. 🌱 Dr. Jane Goodall, naturalist, is one of Ford Motor Company's Heroes for the Planet. A program that's part of ongoing Ford Motor Company initiatives to underwrite and support efforts that make the world a better place. 🌱 To learn more about Dr. Goodall and other Heroes for the Planet, visit our website. You'll find fascinating information, including links to her favorite websites. Around the globe, there are amazing individuals who've dedicated their lives to our planet. You'll find them at www.ford.com/heroes. Stop by. The world is waiting.

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Tarzan[®] owned by Edgar Rice Burroughs, Inc. Used by permission.



EarthPulse

ACROSS BORDERS

Piecing Together Wild Lands

Sonoran Desert: A model for international partnerships

Deserts only seem barren. In the Sonoran, grass roots grow deep. Plants, animals, and people stake their claims across 55 million rugged acres of Arizona, California, and Mexico. These vast lands have owners with sometimes differing interests: military bases, conservation groups, Native Americans, residents rural and urban, and half a dozen state and federal agencies. This crazy quilt's common challenge is how best to preserve the Sonoran's outstanding biodiversity, such as the more than 500 bird species that migrate through, breed, or reside there. The driving concern: The region's human population, six million and climbing, has nearly tripled since 1970.

"All groups must communicate because there

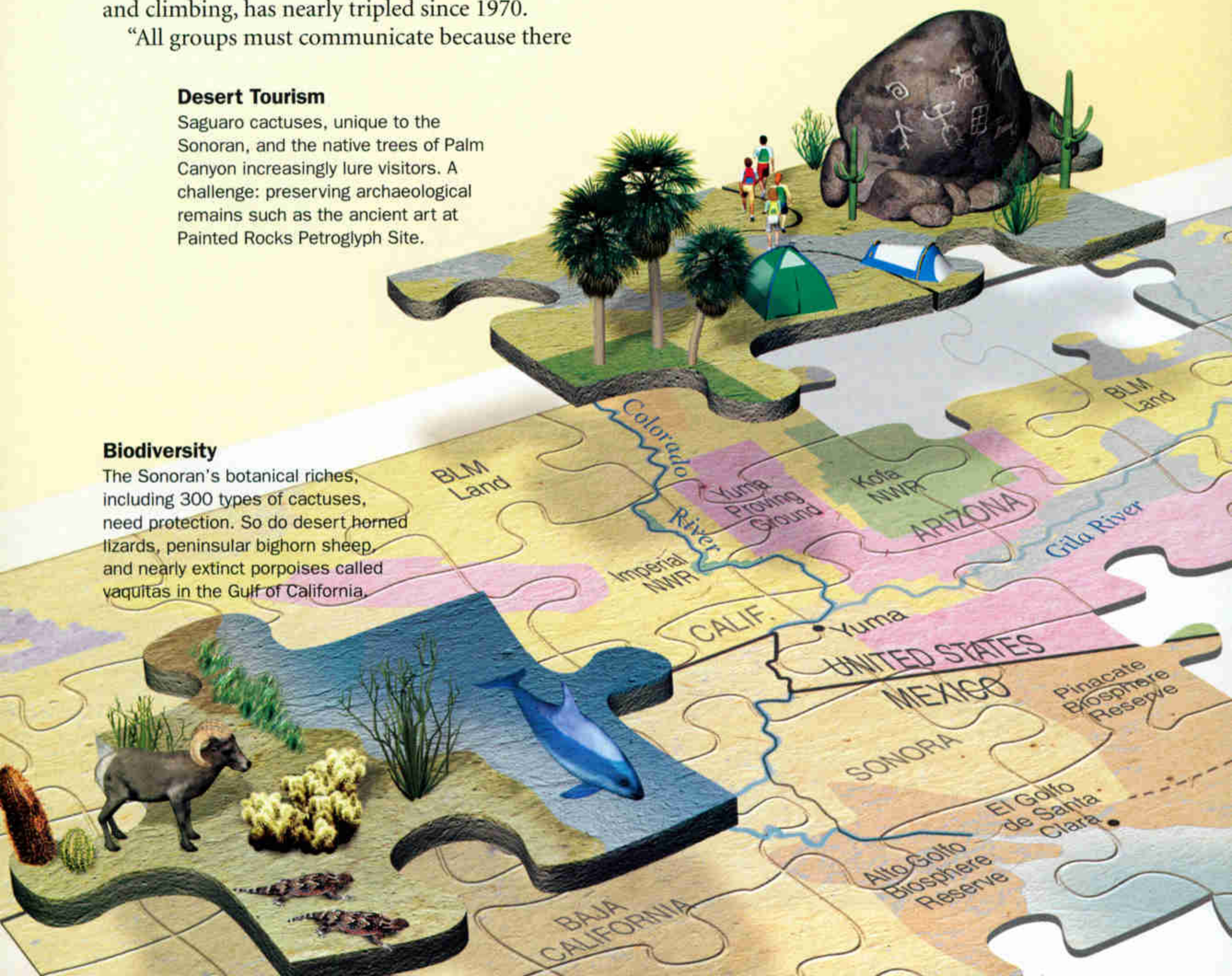
isn't a single umbrella organization," says Steve Cornelius. His Sonoran Institute, along with the Nature Conservancy and Mexico's IMADES environmental institute, has made an assessment of conservation priorities. Already Arizona's Pima County, the Tohono O'odham Nation, and the Department of Defense are developing comprehensive environmental plans. To the inventory of land already protected, some since the 1930s, nearly half a million acres has recently been added as the Sonoran Desert National Monument. This map depicts the region's interlocking elements, with pieces lifted to highlight important conservation issues.

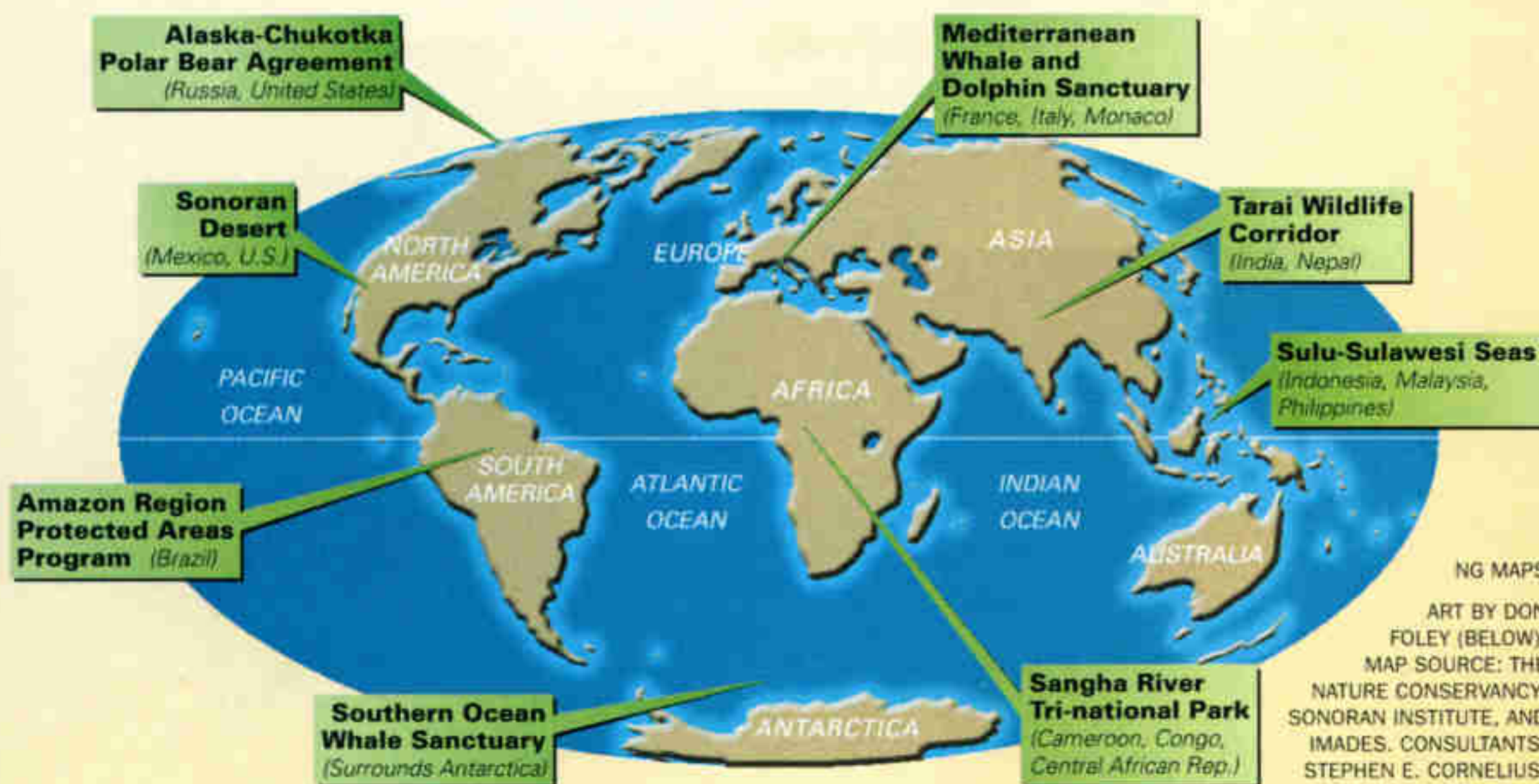
Desert Tourism

Saguaro cactuses, unique to the Sonoran, and the native trees of Palm Canyon increasingly lure visitors. A challenge: preserving archaeological remains such as the ancient art at Painted Rocks Petroglyph Site.

Biodiversity

The Sonoran's botanical riches, including 300 types of cactuses, need protection. So do desert horned lizards, peninsular bighorn sheep, and nearly extinct porpoises called vaquitas in the Gulf of California.





International Agreements

Cooperation grows between nations with animals and plants that know no borders, as in the Arctic, where the U.S. and Russia have signed a polar bear agreement. Three African countries protect a primate-rich lowland tropical forest. India and Nepal preserve tigers and rhinos in the tarai on the edge of the Himalaya. Brazil is assisted in saving its rain forest by the World Wildlife Fund's protected areas program.

NG MAPS
ART BY DON FOLEY (BELOW).
MAP SOURCE: THE NATURE CONSERVANCY, SONORAN INSTITUTE, AND IMADES. CONSULTANTS: STEPHEN E. CORNELIUS, SONORAN INSTITUTE; JOHN A. HALL, THE NATURE CONSERVANCY

Coordinating Efforts

The information researchers gather on Sonoran ecosystems goes into a geographic information system database that can help agencies share resources and create conservation strategies.

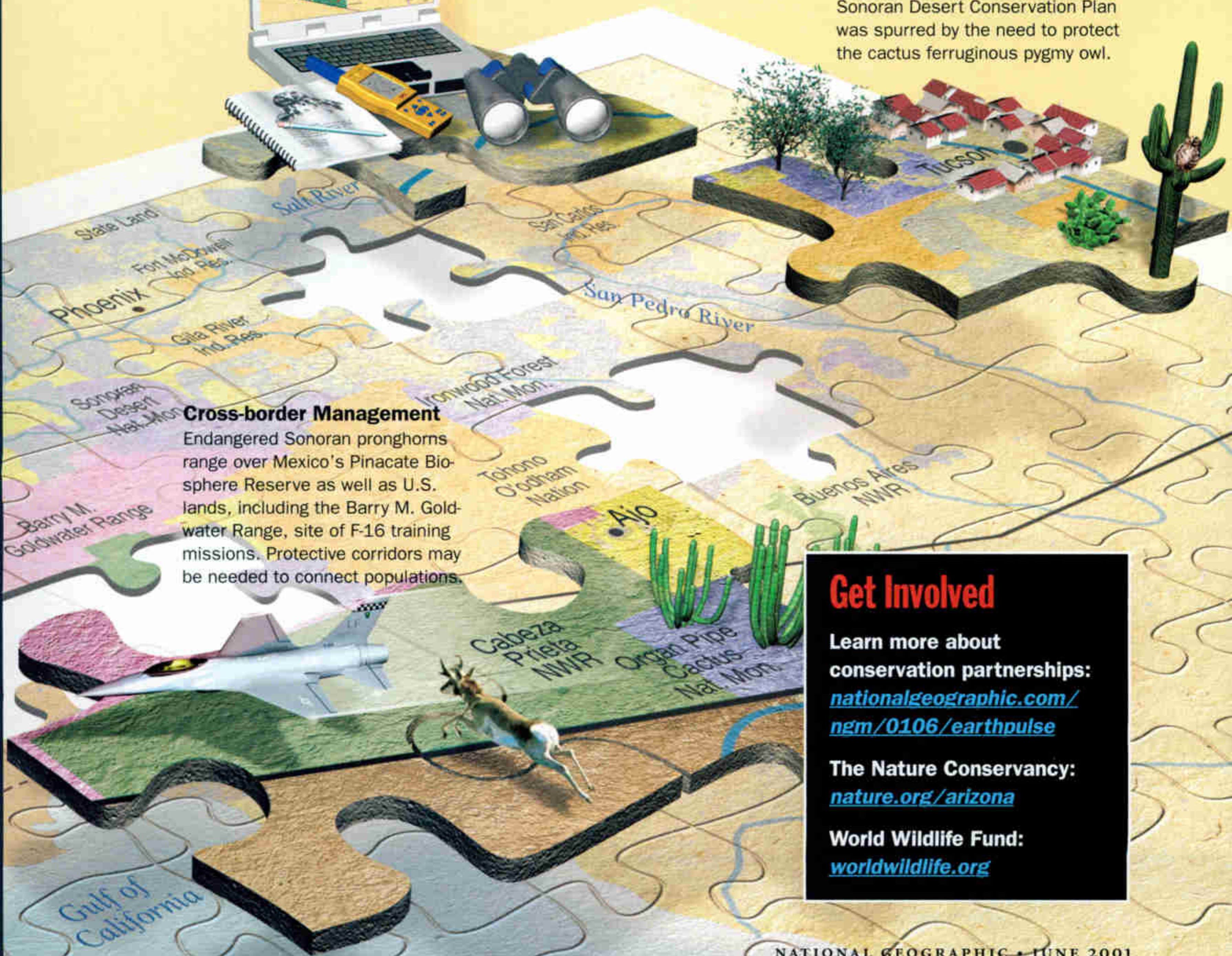


Urban Sprawl

Like Phoenix, Arizona's largest city, Pima County's Tucson has grown with few checks. Pima's proposed Sonoran Desert Conservation Plan was spurred by the need to protect the cactus ferruginous pygmy owl.

Cross-border Management

Endangered Sonoran pronghorns range over Mexico's Pinacate Biosphere Reserve as well as U.S. lands, including the Barry M. Goldwater Range, site of F-16 training missions. Protective corridors may be needed to connect populations.



Get Involved

Learn more about conservation partnerships:
nationalgeographic.com/ngm/0106/earthpulse

The Nature Conservancy:
nature.org/arizona

World Wildlife Fund:
worldwildlife.org

A Cherished Piece of History

RIDES AGAIN



With canvas tops rolled back and red paint gleaming, the Red Bus fleet of Glacier National Park carried generations of spellbound tourists through a landscape of heart-stopping splendor.

Launched in 1937, the elegant touring buses climbed across the continental divide amid sheer cliffs and glacial summits—allowing sightseers to relish the scenery rather than navigate mind-bending curves. For six classic decades, the fleet was a cherished park icon, part of the lore and lure of Glacier itself.

Protecting America's National Parks is a unique way to preserve and share today's treasures with future generations. In that spirit, Ford Motor Company is pleased to join the National Park Foundation and National Park Service as a Proud Partner of America's National Parks. Recognizing the threat posed by park overcrowding, Ford is developing new ways to manage high levels of traffic in our nation's parks. To learn more about this and other efforts, visit www.nationalparks.org.



More than mere transportation, the buses provided a one-of-a-kind education. Drivers identified wildflowers, explained park geology, pointed out the park's elusive mountain goats, shared legends of the Blackfoot Indians, led impromptu hikes to hidden waterfalls, and always knew which pullouts guaranteed the most spectacular photographs.

But by 1999, though more popular than ever, the buses were still running on 1930's automotive technology. Concerns about no emission controls, metal fatigue, and safety finally brought the legendary fleet to a standstill. And, as a new millennium dawned, the Red Buses were retired.

Seasons unfolded, but without the familiar flash of red, the landscape was incomplete. Visitors, rangers, and locals mourned the loss, so linked were the buses to Glacier's history and spirit.

Then an idea. Ford Motor Company stepped in with a plan to implement new technology and expertise in alternative fuels. But rather than using that technology to replace Glacier's outdated buses, Ford suggested using it to preserve the historic fleet. Replace each chassis, convert the entire fleet to run on clean propane fuel, and save a priceless piece of Glacier's heritage.

In March 2001 the plan became reality. And now, a new generation of travelers—perhaps great-great-grandchildren of those first curious tourists—ride the Red Buses again, gasping in wonder at the panorama before them. Today's fleet will leave no footprint on the land and air it traverses. But on the hearts of travelers the imprint, as always, will be unforgettable.

To find out more about Ford Motor Company's involvement with the National Parks, feel free to visit their website.



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APHICA

CREATURES OF OUR UNIVERSE

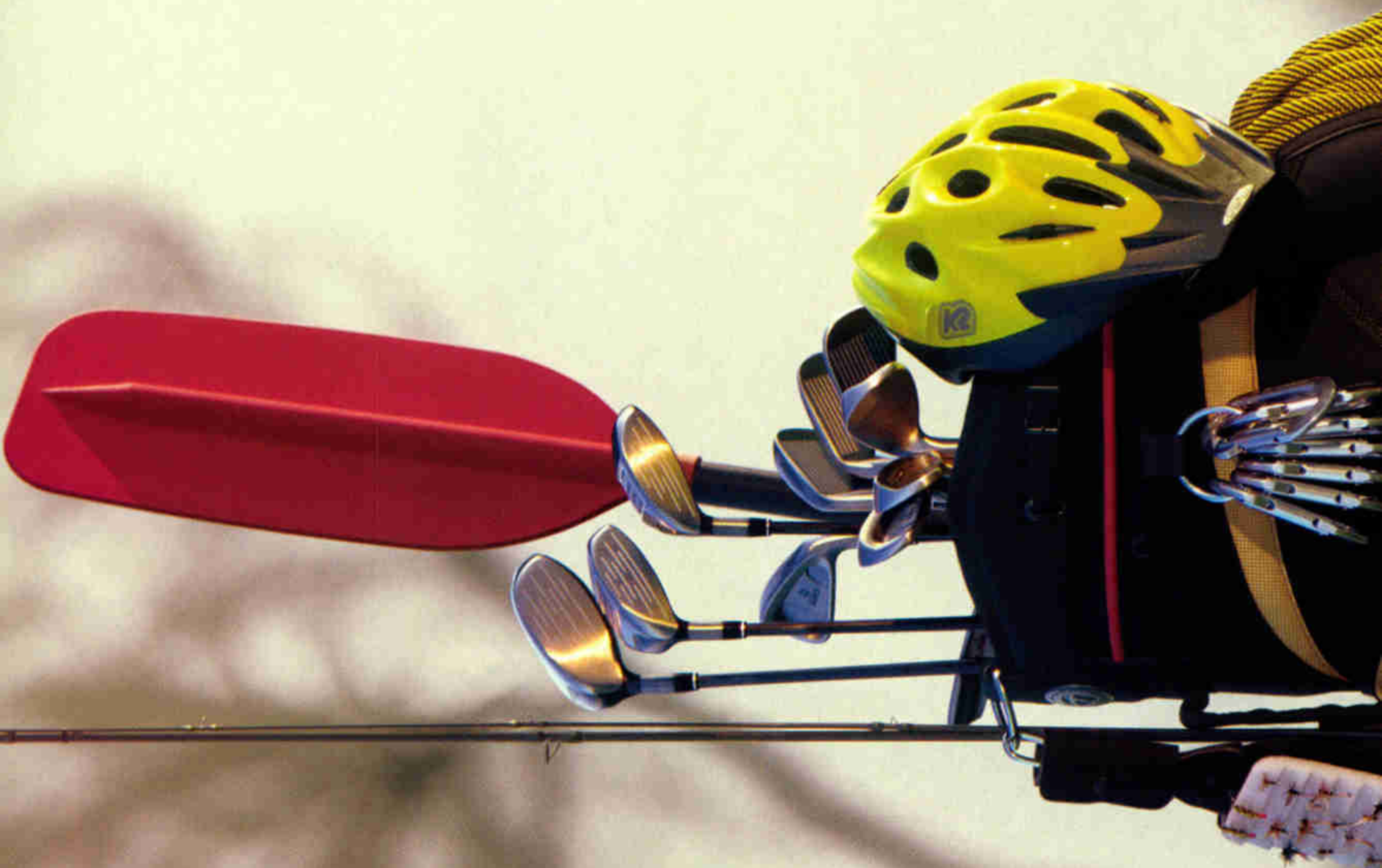
HISTORY

Running to Rust

A railway reaches the end of the line in Alaska

Once this steam locomotive puffed across the elevated train tracks of New York City. When electrification rendered it obsolete, the engine and two others like it were shipped to Alaska's Seward Peninsula in 1903 and 1904. There they pulled the cars of the Council City & Solomon River Railroad, a line serving the Alaska gold rush boom. Though some 50 miles of track were planned, only half the line

was built before the railroad company went bankrupt in 1907. Bad weather, high costs, and a manager who sold the track-construction supplies to a competing railroad hurried its demise. In 1913 a storm swamped the trains, making the tundra their last stop. Until a way can be found to preserve the engines, they rust in peace. "This place," says photographer Colin Garratt, "is an industrial Stonehenge."



EXTREME SWEEPSTAKES

18

Pack accordingly. This isn't the usual track. Well, unless your local country club provides river rafting, hiking, gondola mountain biking, horseback riding, fly fishing. And, of course, an all-new Explorer 02 to shuttle you between mountains.

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1. **NO PURCHASE NECESSARY.** Sweepstakes begins at 12:00 a.m. Eastern Standard Time ("EST") on 5/2/01 and ends at 11:59 p.m. EST on 8/10/01 ("Promotion Period"). 2. **ELIGIBILITY.** Sweepstakes is offered only in the U.S. and is open only to legal residents of the continental U.S., 18 years of age or older who are licensed drivers except for employees (and the immediate families and members of the same household of such employees) of Ford Motor Company, participating Partners, their respective divisions, dealers, affiliates, subsidiaries, advertising and promotion agencies. All federal, state and local laws apply. 3. **HOW TO ENTER.** There are two (2) prize drawings included in this promotion: 1) Grand Prize Drawing, and 2) Golf Challenge Prize Drawing. To enter the Grand Prize Drawing, complete the Extreme Golf Challenge registration form available at www.fordoutfitters.com during the Promotion Period and submit as directed prior to 11:59 p.m. EST on 8/10/01. Once you are registered for the Grand Prize Drawing, you may enter the Golf Challenge Prize Drawing by playing to completion the Three-Hole Extreme Golf Challenge. To be completed by 11:59 p.m. on 8/10/01. Games/Challenge score will not be used to determine prize winner. Limit of one entry per person per drawing. Void in Puerto Rico and where prohibited or restricted. 4. **PRIZES / APPROXIMATE RETAIL VALUE ("ARV")** - Eighteen (18) Grand Prizes - Extreme Golf Weekend for two to Vail Valley, CO on September 16-19, 2001. Trip consists of round-trip, first-class air travel from major commercial airport nearest winner's residence, three-nights accommodations at the Lodge at Carillon, local ground transportation, Sponsor-selected activities, golf equipment rental and meals (ARV \$14,996); One (1) Golf Challenge Prize - 2002 Ford Explorer XLT 4x4 (ARV \$31,000). 5. **PRIZE DRAWINGS.** Random drawings will be conducted on or about 8/15/01 from among all eligible entries received for that drawing. Drawing will be conducted by Exposure Marketing, Inc., an independent judging organization. The odds of winning any drawing depend on the number of valid entries received for that drawing. Prize winners will be notified by mail and will be required to execute and return an Affidavit of Eligibility and Liability Release, except where prohibited, and a Publicity Release within 14 days of notification date. If any winner is under age of majority in state of residence ("minor"), prize will be awarded in the name of his/her parent or legal guardian. Travel companion of Grand Prize winners (or, if minor, his/her parent or legal guardian) will be required to complete and submit Liability Release forms prior to issuance of travel documents. Failure to timely return executed Affidavit and Release will cause prize to be forfeited and awarded to an alternate. Grand Prize winners and companions must travel on same itinerary and on dates specified by Sponsor. Golf Challenge Prize winner, a) is responsible for registration, license, title and insurance fees; b) must present valid driver's license and evidence of insurance at time of delivery, and c) must take delivery of the vehicle through a Sponsor-selected dealership near winner's residence within 60 days of notice of availability or prize may be forfeited and awarded to an alternate. If a prize notification letter is returned undeliverable, an alternate winner may be selected. Acceptance of prize constitutes permission for Sponsor and its respective advertising and promotional agencies to use winner's name, photo and/or likeness and biographical information for advertising and promotional purposes without limitation and without additional compensation unless prohibited by law. Winners will be responsible for all taxes (federal, state and/or local) and all expenses not specified related to acceptance and use of prize. 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Entries void if defective, altered, forged, or obtained outside authorized channels or if submitted in contravention of these rules. If this promotion becomes technically corrupted or compromised due to non-authorized human intervention, Sponsor reserves the right, in its sole discretion, to a) cancel sweepstakes in its entirety, or b) select winner from all eligible entries received prior to the cancellation. By entering, participants: a) agree to these official rules and the decisions of the Sponsor and the judges which shall be binding and final in all respects, and b) release Ford Motor Company, Exposure Marketing, Inc., their respective divisions, subsidiaries, affiliates, directors, officers, employees and agents from any and all liability for any injuries, losses or damages of any kind caused by their participation or resulting from acceptance, possession, use, or misuse of any prize, and acknowledge that said parties have neither made nor are in any manner responsible or liable for any warranty, representation, or guarantee, expressed or implied, in fact or in law, relating to the prize including, but not limited to, its quality, mechanical condition or fitness. 7. **WINNERS.** To obtain the names of winners via mail (after 9/1/01), send a stamped, self-addressed envelope to: Ford Explorer Extreme 18 Sweepstakes-Winners, P.O. Box 1871, Byron, MI 48418. 8. **SPONSOR:** Ford Motor Company, One American Road, Dearborn, MI 48126.



KEITH DANMILLER

CONSERVATION

Tide of Visitors for Turtles?

New hotel opposed on Mexican beach



Loggerhead and green sea turtles, Morelet's crocodiles, boa constrictors, arboreal anteaters, margays, and jaguarundis—all share a tiny haven on Mexico's Caribbean

coast. But large numbers of another species—tourists—may be added. “Development has run rampant on the

Yucatán coast. This is the last stand,” says conservationist Mary Louise Whitlow. She is part of a coalition opposing a 1,400-room hotel complex that may be built about 60 miles south of Cancún at a site with a Maya echo: Xcacel (shkah-SEL).

In 1998 a Spanish company was allowed to buy about 110 acres of beachfront property at Xcacel. Opponents filed lawsuits. Last November a government permit for the hotel development was approved. Shortly afterward, Mexico's new president, Vicente Fox, pledged in his inaugural address to build a “Mexico with an environmental conscience.” The Xcacel case is now being reviewed.

About a hundred yards of the beach is a small sanctuary for the sea turtles. “But if thousands of tourists arrive, the turtles' habitat will be destroyed,” says Whitlow.

ALMANAC

June

After migrating hundreds of miles north from their winter grounds, some 130,000 caribou in the Porcupine herd finally reach Alaska's coastal plain on the Beaufort Sea. Many females give birth in the Arctic National Wildlife Refuge, where oil and gas development are hotly debated.



ART BY PETER GAEDE

MARINE BIOLOGY

The “Headlight” Fish

“Like a deep-sea Lamborghini, the loosejaw fish has retractable headlights,” says Edith Widder of Harbor Branch Oceanographic Institution. Captured 2,000 feet deep off northwest Africa, the six-inch-long fish has a bioluminescent organ in each cheek, just behind the eye, probably to help locate prey and attract a mate. But the lights may also lure predators. To blend into the inky depths, the fish can hide the organs by rolling them down and retracting them into its cheeks. This sequence shows, from top, an organ wide open, halfway closed, and fully shut.

EDITH WIDDER

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I chose not to accept mine and asked about VIAGRA.

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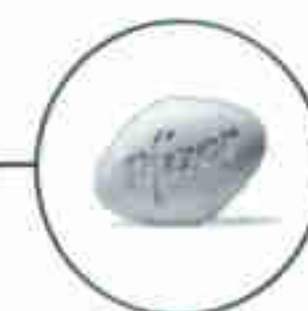
If you're a man who uses nitrate drugs, never take VIAGRA—your blood pressure could suddenly drop to an unsafe level. With VIAGRA, the most common side effects are headache, facial flushing, and upset stomach. VIAGRA may also briefly cause bluish vision, sensitivity to light, or blurred vision. In the rare event of an erection lasting more than 4 hours, seek immediate medical help. Remember to protect yourself and your partner from sexually transmitted diseases.

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PATIENT SUMMARY OF INFORMATION ABOUT

VIAGRA[®]
(sildenafil citrate) tablets

This summary contains important information about VIAGRA[®]. It is not meant to take the place of your doctor's instructions. Read this information carefully before you start taking VIAGRA. Ask your doctor or pharmacist if you do not understand any of this information or if you want to know more about VIAGRA.

This medicine can help many men when it is used as prescribed by their doctors. However, VIAGRA is not for everyone. It is intended for use only by men who have a condition called erectile dysfunction. **VIAGRA must never be used by men who are taking medicines that contain nitrates of any kind, at any time. This includes nitroglycerin. If you take VIAGRA with any nitrate medicine your blood pressure could suddenly drop to an unsafe or life threatening level.**

What Is VIAGRA?

VIAGRA is a pill used to treat erectile dysfunction (impotence) in men. It can help many men who have erectile dysfunction get and keep an erection when they become sexually excited (stimulated).

You will not get an erection just by taking this medicine. VIAGRA helps a man with erectile dysfunction get an erection only when he is sexually excited.

How Sex Affects the Body

When a man is sexually excited, the penis rapidly fills with more blood than usual. The penis then expands and hardens. This is called an erection. After the man is done having sex, this extra blood flows out of the penis back into the body. The erection goes away. If an erection lasts for a long time (more than 6 hours), it can permanently damage your penis. You should call a doctor immediately if you ever have a prolonged erection that lasts more than 4 hours.

Some conditions and medicines interfere with this natural erection process. The penis cannot fill with enough blood. The man cannot have an erection. This is called erectile dysfunction if it becomes a frequent problem.

During sex, your heart works harder. Therefore sexual activity may not be advisable for people who have heart problems. Before you start any treatment for erectile dysfunction, ask your doctor if your heart is healthy enough to handle the extra strain of having sex. If you have chest pains, dizziness or nausea during sex, stop having sex and immediately tell your doctor you have had this problem.

How VIAGRA Works

VIAGRA enables many men with erectile dysfunction to respond to sexual stimulation. When a man is sexually excited, VIAGRA helps the penis fill with enough blood to cause an erection. After sex is over, the erection goes away.

VIAGRA Is Not for Everyone

As noted above (*How Sex Affects the Body*), ask your doctor if your heart is healthy enough for sexual activity.

If you take any medicines that contain nitrates—either regularly or as needed—you should never take VIAGRA. If you take VIAGRA with any nitrate medicine or recreational drug containing nitrates, your blood pressure could suddenly drop to an unsafe level. You could get dizzy, faint, or even have a heart attack or stroke. Nitrates are found in many prescription medicines that are used to treat angina (chest pain due to heart disease) such as:

- nitroglycerin (sprays, ointments, skin patches or pastes, and tablets that are swallowed or dissolved in the mouth)
- isosorbide mononitrate and isosorbide dinitrate (tablets that are swallowed, chewed, or dissolved in the mouth)

Nitrates are also found in recreational drugs such as amyl nitrate or nitrite ("poppers"). If you are not sure if any of your medicines contain nitrates, or if you do not understand what nitrates are, ask your doctor or pharmacist.

VIAGRA is only for patients with erectile dysfunction. VIAGRA is not for newborns, children, or women. Do not let anyone else take your VIAGRA. VIAGRA must be used only under a doctor's supervision.

What VIAGRA Does Not Do

- VIAGRA does not cure erectile dysfunction. It is a treatment for erectile dysfunction.
- VIAGRA does not protect you or your partner from getting sexually transmitted diseases, including HIV—the virus that causes AIDS.
- VIAGRA is not a hormone or an aphrodisiac.

What To Tell Your Doctor Before You Begin VIAGRA

Only your doctor can decide if VIAGRA is right for you. VIAGRA can cause mild, temporary lowering of your blood pressure. You will need to have a thorough medical exam to diagnose your erectile dysfunction and to find out if you can safely take VIAGRA alone or with your other medicines. Your doctor should determine if your heart is healthy enough to handle the extra strain of having sex.

Be sure to tell your doctor if you:

- have ever had any heart problems (e.g., angina, chest pain, heart failure, irregular heart beats, or heart attack)
- have ever had a stroke
- have low or high blood pressure

- have a rare inherited eye disease called retinitis pigmentosa
- have ever had any kidney problems
- have ever had any liver problems
- have ever had any blood problems, including sickle cell anemia or leukemia
- are allergic to sildenafil or any of the other ingredients of VIAGRA tablets
- have a deformed penis, Peyronie's disease, or ever had an erection that lasted more than 4 hours
- have stomach ulcers or any types of bleeding problems
- are taking any other medicines

VIAGRA and Other Medicines

Some medicines can change the way VIAGRA works. Tell your doctor about **any medicines** you are taking. Do not start or stop taking any medicines before checking with your doctor or pharmacist. This includes prescription and nonprescription medicines or remedies. Remember, VIAGRA should never be used with medicines that contain nitrates (see *VIAGRA Is Not for Everyone*). If you are taking a protease inhibitor, your dose may be adjusted (please see *Finding the Right Dose for You*.) VIAGRA should not be used with any other medical treatments that cause erections. These treatments include pills, medicines that are injected or inserted into the penis, implants or vacuum pumps.

Finding the Right Dose for You

VIAGRA comes in different doses (25 mg, 50 mg and 100 mg). If you do not get the results you expect, talk with your doctor. You and your doctor can determine the dose that works best for you.

- Do not take more VIAGRA than your doctor prescribes.
- If you think you need a larger dose of VIAGRA, check with your doctor.
- VIAGRA should not be taken more than once a day.

If you are older than age 65, or have serious liver or kidney problems, your doctor may start you at the lowest dose (25 mg) of VIAGRA. If you are taking protease inhibitors, such as for the treatment of HIV, your doctor may recommend a 25 mg dose and may limit you to a maximum single dose of 25 mg of VIAGRA in a 48 hour period.

How To Take VIAGRA

Take VIAGRA about one hour before you plan to have sex. Beginning in about 30 minutes and for up to 4 hours, VIAGRA can help you get an erection if you are sexually excited. If you take VIAGRA after a high-fat meal (such as a cheeseburger and french fries), the medicine may take a little longer to start working. VIAGRA can help you get an erection when you are sexually excited. You will not get an erection just by taking the pill.

Possible Side Effects

Like all medicines, VIAGRA can cause some side effects. These effects are usually mild to moderate and usually don't last longer than a few hours. Some of these side effects are more likely to occur with higher doses. The most common side effects of VIAGRA are headache, flushing of the face, and upset stomach. Less common side effects that may occur are temporary changes in color vision (such as trouble telling the difference between blue and green objects or having a blue color tinge to them), eyes being more sensitive to light, or blurred vision.

In rare instances, men have reported an erection that lasts many hours. You should call a doctor immediately if you ever have an erection that lasts more than 4 hours. If not treated right away, permanent damage to your penis could occur (see *How Sex Affects the Body*).

Heart attack, stroke, irregular heart beats, and death have been reported rarely in men taking VIAGRA. Most, but not all, of these men had heart problems before taking this medicine. It is not possible to determine whether these events were directly related to VIAGRA.

VIAGRA may cause other side effects besides those listed on this sheet. If you want more information or develop any side effects or symptoms you are concerned about, call your doctor.

Accidental Overdose

In case of accidental overdose, call your doctor right away.

Storing VIAGRA

Keep VIAGRA out of the reach of children. Keep VIAGRA in its original container. Store at room temperature, 59°-86°F (15°-30°C).

For More Information on VIAGRA

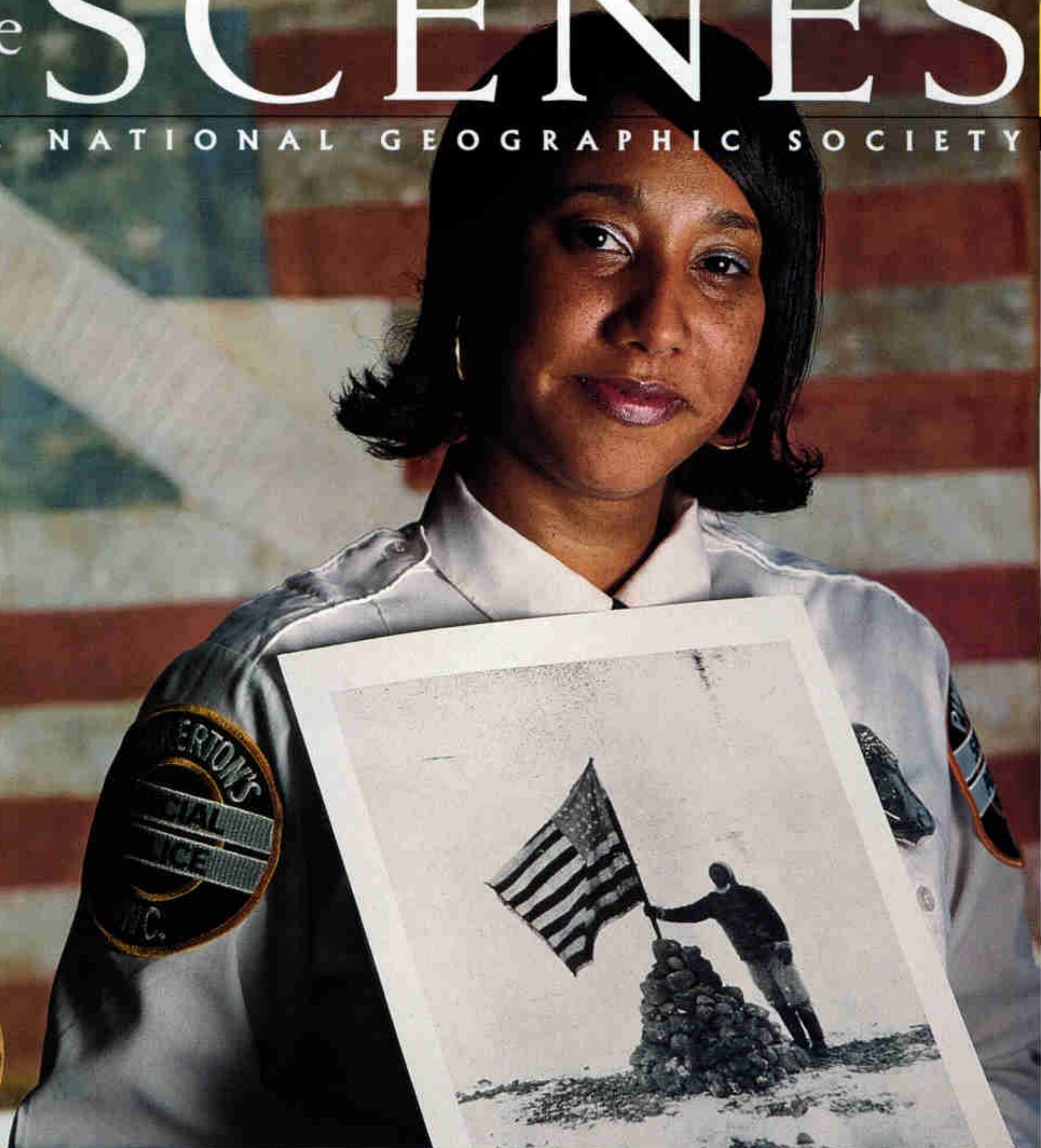
VIAGRA is a prescription medicine used to treat erectile dysfunction. Only your doctor can decide if it is right for you. This sheet is only a summary. If you have any questions or want more information about VIAGRA, talk with your doctor or pharmacist, visit www.viagra.com, or call 1-888-4VIAGRA.

23-5515-00-4

VIAGRA[®]
(sildenafil citrate) tablets

Behind the SCENES

AT THE NATIONAL GEOGRAPHIC SOCIETY



MARK THIESSEN, NGS

The Ties That Bind

A medal ceremony becomes a family affair

When the Society awarded polar explorer Matthew Henson its Hubbard Medal—the first ever given posthumously—Leila Savoy Andrade, a security officer at our headquarters, showed up in civilian clothes. “What are you doing here?” asked our surprised President, John Fahey.

“That’s my uncle,” she replied.

To be precise, Henson is Leila’s great-great-great-uncle. Few at the Society, where she has worked for three years, knew of her link to the black adventurer

who assisted Robert E. Peary in Arctic exploration. “Everyone in the family always said great things about him when I was growing up,” says Leila, holding Henson’s photograph (above) in front of a flag carried on early 20th-century attempts to reach the North Pole.

Leila was one of nine family members attending the medal ceremony. Fittingly, it was held at the newly dedicated Matthew Henson Earth Conservation Center on the banks of the Anacostia River in Washington, D.C.

100 YEARS AGO



June

“A wall begun two centuries before Christ was completed nearly sixteen centuries after Christ. Can anything better illustrate the great age and astonishing conservatism of China than this simple record? What are the sixty years of China’s present modern foreign relations in comparison!”

—From *“China: Her History and Development,”* by John Barrett

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Going to the Source Again

Where the Amazon starts

In our October 1972 issue writer-photographer Loren McIntyre reported reaching “the farthest source of the Amazon yet discovered”: a tiny Peruvian mountain lake 17,220 feet high in the Andes that a

colleague named Laguna McIntyre—Lake McIntyre.

Others have claimed that different sites mark the spot where the river begins. Now, nearly three decades after Loren’s journey, a 22-person team funded by our Expeditions Council and led by Andrew A. Pietowski (left) has pinpointed the Amazon’s source using the global positioning system. Some 40,000 GPS readings confirm that “Loren was right: The Amazon starts in the lake named after him,” says Pietowski, a veteran explorer. “A drop of water from Lake McIntyre flows 4,000 miles to the Atlantic.”

To the Summit

These geography teachers from Washington State (right) deserve their rest: They made a four-hour climb to the 8,363-foot-high summit of Mount St. Helens as part of a summer field institute created by the state’s Geographic Alliance. Accompanying the 18 teachers to the top was Lanny Proffer, in the black hat, of our geography education outreach program, which helps build alliances in the U.S. and Canada. Says Michael Papritz, the institute’s director, “These teachers got the full picture of the mountain in historic, economic, and physical terms.”



MICHAEL PAPRITZ

FOR MORE INFORMATION

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TODAY

Develop smart highway
systems to help traffic
move more smoothly



TOMORROW

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"A squirrel short-circuited the garage door."

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In San Diego, Toyota has tested a highway system that helps vehicles automatically maintain a safe distance from each other, regulating traffic flow. And our engineers are also developing on-board computers that monitor traffic congestion, suggest quicker alternative routes — even locate vacant parking spaces.

But that's just the beginning. We won't stop until bumper-to-bumper crawls are a thing of the past. And to those who say that's not possible, we have just one thing to say. Excuses, excuses, excuses.

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GEORGE STEINMETZ

Need a Holiday?

National Geographic Traveler has thousands of ideas for getaways, exhibitions, events. On our new searchable travel calendar you can key in a place, date, or activity to find out what's happening where—everywhere. You may never miss another Kamehameha Day parade. Hint: Search "Hawaii" at nationalgeographic.com/traveler/calendar.

Go Greek

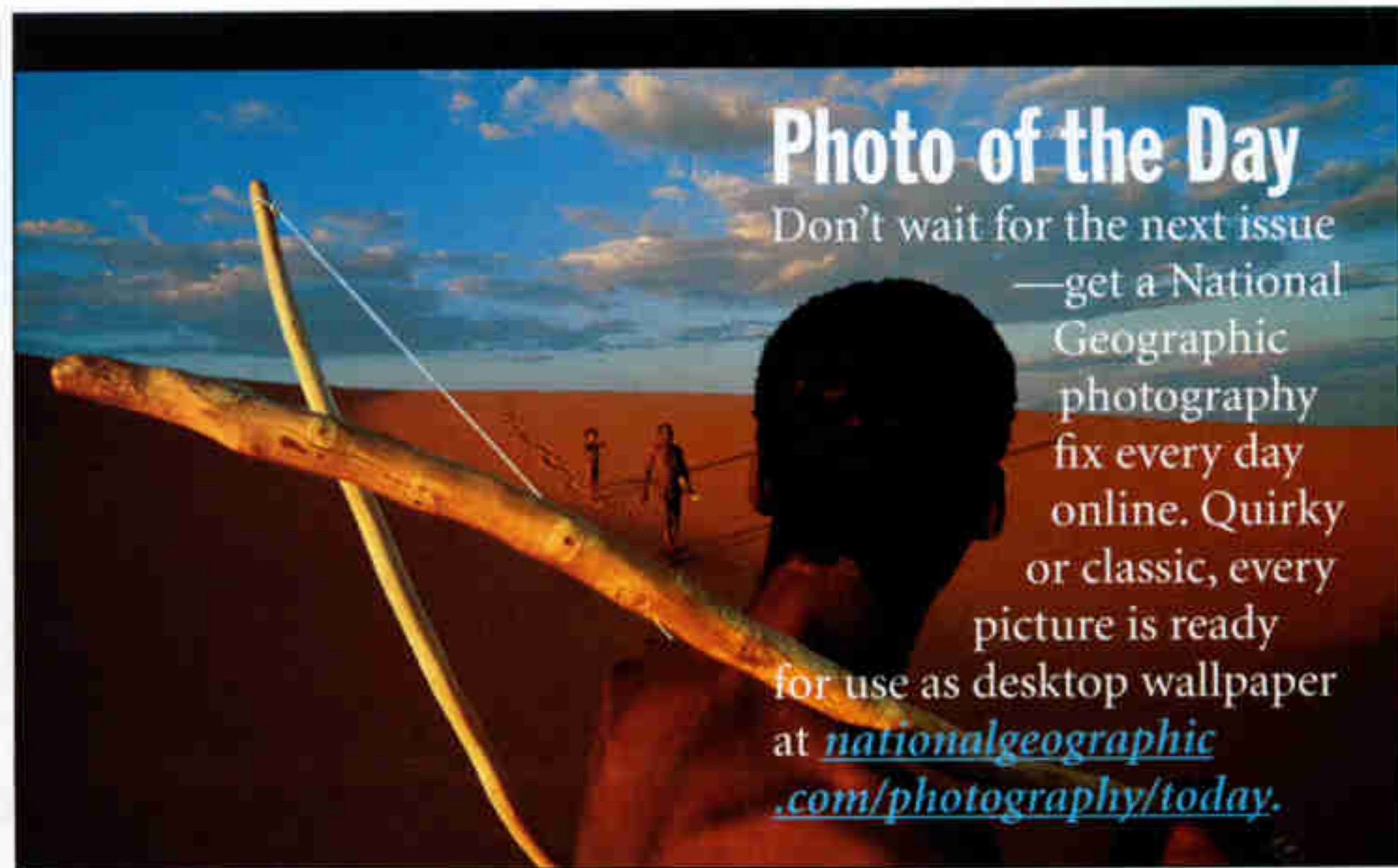
Gunshots, high-flying dances, and grilled goat testicles—Jim Metzner chronicles just how far, and high, locals in a village on Crete go to celebrate the spring cherry harvest. "It was like being morphed into *Zorba the Greek*," he says. At Pulse of the Planet, see and hear what has them hopping: nationalgeographic.com/pulseplanet.



PHIL METZIDAKIS

Photo of the Day

Don't wait for the next issue—get a National Geographic photography fix every day online. Quirky or classic, every picture is ready for use as desktop wallpaper at nationalgeographic.com/photography/today.



CHRIS JOHNS, NGS PHOTOGRAPHER

For people with Acid Reflux Disease

It's time to check your tummy out of the Heartburn Hotel.

Complete 24-hour heartburn relief is possible. Ask your doctor about Prevacid.

If you're suffering from persistent heartburn two or more days a week, even though you've treated it and changed your diet, it could be a sign of Acid Reflux Disease.

- Prevacid is a prescription medicine that can mean complete day and night relief from heartburn associated with Acid Reflux Disease. Individual results may vary.
- Once-a-day Prevacid works in a different way than over-the-counter heartburn remedies. Prevacid turns off tiny pumps that produce acid in your stomach.



Tiny pumps produce acid in your stomach.



Prevacid turns many of these pumps off.

- Millions of prescriptions have been written for Prevacid.
- Prevacid has a low occurrence of side effects, such as diarrhea (3.6%), abdominal pain (1.8%) and nausea (1.4%).

Ask your doctor for more information about Prevacid and if it's right for you. Find out how 24-hour Prevacid can help you and your tummy check out of the Heartburn Hotel.

For a free information kit call 1-888-607-ACID

PREVACID[®]

LANSOPRAZOLE 15-mg and 30-mg capsules

Leave your heartburn behind

Brief Summary of Prescribing Information
(Nos. 1541, 3046)
03-5073-R15-Brf., Rev. November, 2000

PREVACID®

(prē'-va-sid)
(lansoprazole)

Delayed-Release Capsules

INDICATIONS AND USAGE

PREVACID Delayed-Release Capsules are indicated for: 1. Short-Term Treatment of Active Duodenal Ulcer 2. *H. pylori* Eradication to Reduce the Risk of Duodenal Ulcer Recurrence 3. Maintenance of Healed Duodenal Ulcers 4. Short-Term Treatment of Active Benign Gastric Ulcer 5. Healing of NSAID-Associated Gastric Ulcer 6. Risk Reduction of NSAID-Associated Gastric Ulcer 7. Treatment of Heartburn and Other Symptoms Associated with GERD (Gastroesophageal Reflux Disease) 8. Short-Term Treatment of Erosive Esophagitis 9. Maintenance of Healing of Erosive Esophagitis 10. Pathological Hypersecretory Conditions Including Zollinger-Ellison Syndrome

CONTRAINDICATIONS

PREVACID Delayed-Release Capsules are contraindicated in patients with known hypersensitivity to any component of the formulation.

Amoxicillin is contraindicated in patients with a known hypersensitivity to any penicillin. (Please refer to full prescribing information for amoxicillin before prescribing.)

Clarithromycin is contraindicated in patients with a known hypersensitivity to any macrolide antibiotic, and in patients receiving terfenadine therapy who have preexisting cardiac abnormalities or electrolyte disturbances. (Please refer to full prescribing information for clarithromycin before prescribing.)

WARNINGS

CLARITHROMYCIN SHOULD NOT BE USED IN PREGNANT WOMEN EXCEPT IN CLINICAL CIRCUMSTANCES WHERE NO ALTERNATIVE THERAPY IS APPROPRIATE. IF PREGNANCY OCCURS WHILE TAKING CLARITHROMYCIN, THE PATIENT SHOULD BE APPRISED OF THE POTENTIAL HAZARD TO THE FETUS. (SEE WARNINGS IN PRESCRIBING INFORMATION FOR CLARITHROMYCIN.)

Pseudomembranous colitis has been reported with nearly all antibacterial agents, including clarithromycin and amoxicillin, and may range in severity from mild to life threatening. Therefore, it is important to consider this diagnosis in patients who present with diarrhea subsequent to the administration of antibacterial agents.

Treatment with antibacterial agents alters the normal flora of the colon and may permit overgrowth of clostridia. Studies indicate that a toxin produced by *Clostridium difficile* is a primary cause of "antibiotic-associated colitis."

After the diagnosis of pseudomembranous colitis has been established, therapeutic measures should be initiated. Mild cases of pseudomembranous colitis usually respond to discontinuation of the drug alone. In moderate to severe cases, consideration should be given to management with fluids and electrolytes, protein supplementation, and treatment with an antibacterial drug clinically effective against *Clostridium difficile* colitis.

Serious and occasionally fatal hypersensitivity (anaphylactic) reactions have been reported in patients on penicillin therapy. These reactions are more apt to occur in individuals with a history of penicillin hypersensitivity and/or a history of sensitivity to multiple allergens.

There have been well-documented reports of individuals with a history of penicillin hypersensitivity reactions who have experienced severe hypersensitivity reactions when treated with a cephalosporin. Before initiating therapy with any penicillin, careful inquiry should be made concerning previous hypersensitivity reactions to penicillins, cephalosporins, and other allergens. If an allergic reaction occurs, amoxicillin should be discontinued and the appropriate therapy instituted.

SERIOUS ANAPHYLACTIC REACTIONS REQUIRE IMMEDIATE EMERGENCY TREATMENT WITH EPINEPHRINE, OXYGEN, INTRAVENOUS STEROIDS, AND AIRWAY MANAGEMENT, INCLUDING INTUBATION, SHOULD ALSO BE ADMINISTERED AS INDICATED.

PRECAUTIONS

General

Symptomatic response to therapy with lansoprazole does not preclude the presence of gastric malignancy.

Information for Patients

PREVACID Delayed-Release Capsules should be taken before eating.

Alternative Administration Options

For patients who have difficulty swallowing capsules, PREVACID Delayed-Release Capsules can be opened, and the intact granules contained within can be sprinkled on one tablespoon of either applesauce, ENSURE® pudding, cottage cheese, yogurt, or strained pears and swallowed immediately. The granules should not be chewed or crushed. Alternatively, PREVACID Delayed-Release Capsules may be emptied into a small volume of either orange juice or tomato juice (60 mL—approximately 2 ounces), mixed briefly and swallowed immediately. To insure complete delivery of the dose, the glass should be rinsed with two or more volumes of juice and the contents swallowed immediately. The granules have also been shown *in vitro* to remain intact when exposed to apple, cranberry, grape, orange, pineapple, prune, tomato, and V-8® vegetable juice and stored for up to 30 minutes.

For patients who have a nasogastric tube in place, PREVACID Delayed-Release Capsules can be opened and the intact granules mixed in 40 mL of apple juice and injected through the nasogastric tube into the stomach. After administering the granules, the nasogastric tube should be flushed with additional apple juice to clear the tube.

Drug Interactions

Lansoprazole is metabolized through the cytochrome P₄₅₀ system, specifically through the CYP3A and CYP2C19 isozymes. Studies have shown that lansoprazole does not have clinically significant interactions with other drugs metabolized by the cytochrome P₄₅₀ system, such as warfarin, antipyrine, indomethacin, ibuprofen, phenytoin, propranolol, prednisone, diazepam, clarithromycin, or terfenadine in healthy subjects. These compounds are metabolized through various cytochrome P₄₅₀ isozymes including CYP1A2, CYP2C9, CYP2C19, CYP2D6, and CYP3A. When lansoprazole was administered concomitantly with theophylline (CYP1A2, CYP3A), a minor increase (10%) in the clearance of theophylline was seen. Because of the small magnitude and the direction of the effect on theophylline clearance, this interaction is unlikely to be of clinical concern. Nonetheless, individual patients may require additional titration of their theophylline dosage when lansoprazole is started or stopped to ensure clinically effective blood levels.

Lansoprazole has also been shown to have no clinically significant interaction with amoxicillin.

In a single-dose crossover study examining lansoprazole 30 mg and omeprazole 20 mg each administered alone and concomitantly with sucralfate 1 gram, absorption of the proton pump inhibitors was delayed and their bioavailability was reduced by 17% and 16%, respectively,

when administered concomitantly with sucralfate. Therefore, proton pump inhibitors should be taken at least 30 minutes prior to sucralfate. In clinical trials, antacids were administered concomitantly with PREVACID Delayed-Release Capsules; this did not interfere with its effect.

Lansoprazole causes a profound and long-lasting inhibition of gastric acid secretion; therefore, it is theoretically possible that lansoprazole may interfere with the absorption of drugs where gastric pH is an important determinant of bioavailability (eg, ketoconazole, ampicillin esters, iron salts, digoxin).

Carcinogenesis, Mutagenesis, Impairment of Fertility

In two 24-month carcinogenicity studies, Sprague-Dawley rats were treated orally with doses of 5 to 150 mg/kg/day, about 1 to 40 times the exposure on a body surface (mg/m²) basis, of a 50-kg person of average height (1.46 m² body surface area) given the recommended human dose of 30 mg/day (22.2 mg/m²). Lansoprazole produced dose-related gastric enterochromaffin-like (ECL) cell hyperplasia and ECL cell carcinoids in both male and female rats. It also increased the incidence of intestinal metaplasia of the gastric epithelium in both sexes. In male rats, lansoprazole produced a dose-related increase of testicular interstitial cell adenomas. The incidence of these adenomas in rats receiving doses of 15 to 150 mg/kg/day (4 to 40 times the recommended human dose based on body surface area) exceeded the low background incidence (range = 1.4 to 10%) for this strain of rat. Testicular interstitial cell adenoma also occurred in 1 of 30 rats treated with 50 mg/kg/day (13 times the recommended human dose based on body surface area) in a 1-year toxicity study.

In a 24-month carcinogenicity study, CD-1 mice were treated orally with doses of 15 to 600 mg/kg/day, 2 to 80 times the recommended human dose based on body surface area. Lansoprazole produced a dose-related increase in incidence of gastric ECL cell hyperplasia. It also produced an increased incidence of liver tumors (hepatocellular adenoma plus carcinoma). The tumor incidences in male mice treated with 300 and 600 mg/kg/day (40 to 80 times the recommended human dose based on body surface area) and female mice treated with 150 to 600 mg/kg/day (20 to 80 times the recommended human dose based on body surface area) exceeded the ranges of background incidences in historical controls for this strain of mice. Lansoprazole treatment produced adenoma of rete testis in male mice receiving 75 to 600 mg/kg/day (10 to 80 times the recommended human dose based on body surface area).

Lansoprazole was not genotoxic in the Ames test, the *ex vivo* rat hepatocyte unscheduled DNA synthesis (UDS) test, the *in vivo* mouse micronucleus test or the rat bone marrow cell chromosomal aberration test. It was positive in *in vitro* human lymphocyte chromosomal aberration assays.

Lansoprazole at oral doses up to 150 mg/kg/day (40 times the recommended human dose based on body surface area) was found to have no effect on fertility and reproductive performance of male and female rats.

Pregnancy: Teratogenic Effects.

Pregnancy Category B

Lansoprazole

Teratology studies have been performed in pregnant rats at oral doses up to 150 mg/kg/day (40 times the recommended human dose based on body surface area) and pregnant rabbits at oral doses up to 30 mg/kg/day (16 times the recommended human dose based on body surface area) and have revealed no evidence of impaired fertility or harm to the fetus due to lansoprazole.

There are, however, no adequate or well-controlled studies in pregnant women. Because animal reproduction studies are not always predictive of human response, this drug should be used during pregnancy only if clearly needed.

Pregnancy Category C

Clarithromycin

See WARNINGS (above) and full prescribing information for clarithromycin before using in pregnant women.

Nursing Mothers

Lansoprazole or its metabolites are excreted in the milk of rats. It is not known whether lansoprazole is excreted in human milk. Because many drugs are excreted in human milk, because of the potential for serious adverse reactions in nursing infants from lansoprazole, and because of the potential for tumorigenicity shown for lansoprazole in rat carcinogenicity studies, a decision should be made whether to discontinue nursing or to discontinue the drug, taking into account the importance of the drug to the mother.

Pediatric Use

Safety and effectiveness in pediatric patients have not been established.

Use in Women

Over 800 women were treated with lansoprazole. Ulcer healing rates in females were similar to those in males. The incidence rates of adverse events were also similar to those seen in males.

Use in Geriatric Patients

Ulcer healing rates in elderly patients are similar to those in a younger age group. The incidence rates of adverse events and laboratory test abnormalities are also similar to those seen in younger patients. For elderly patients, dosage and administration of lansoprazole need not be altered for a particular indication.

ADVERSE REACTIONS

Clinical

Worldwide, over 6100 patients have been treated with lansoprazole in Phase 2-3 clinical trials involving various dosages and durations of treatment. In general, lansoprazole treatment has been well-tolerated in both short-term and long-term trials.

The following adverse events were reported by the treating physician to have a possible or probable relationship to drug in 1% or more of PREVACID-treated patients and occurred at a greater rate in PREVACID-treated patients than placebo-treated patients:

Incidence of Possibly or Probably

Treatment-Related Adverse Events in Short-Term, Placebo-Controlled Studies

Body System/Adverse Event	PREVACID (N=1457) %	Placebo (N=467) %
Body as a Whole		
Abdominal Pain	1.8	1.3
Digestive System		
Diarrhea	3.6	2.6
Nausea	1.4	1.3

Headache was also seen at greater than 1% incidence but was more common on placebo. The incidence of diarrhea was similar between patients who received placebo and patients who received lansoprazole 15 mg and 30 mg, but higher in the patients who received lansoprazole 60 mg (2.9%, 1.4%, 4.2%, and 7.4%, respectively).

The most commonly reported possibly or probably treatment-related adverse event during maintenance therapy was diarrhea.

In the risk reduction study of PREVACID for NSAID-associated gastric ulcers, the incidence of diarrhea for patients treated with PREVACID was 5%, misoprostol 22%, and placebo 3%.

Additional adverse experiences occurring in <1% of patients or subjects in domestic trials are shown below. Refer to **Postmarketing** for adverse reactions occurring since the drug was marketed.

Body as a Whole - asthenia, candidiasis, chest pain (not otherwise specified), edema, fever, flu syndrome, halitosis, infection (not otherwise specified), malaise; **Cardiovascular System** - angina, cerebrovascular accident, hypertension/hypotension, myocardial infarction, palpitations, shock (circulatory failure), vasodilation; **Digestive System** - anorexia, bezoar, cardiospasm, cholelithiasis, constipation, dry mouth/thirst, dyspepsia, dysphagia, eructation, esophageal stenosis, esophageal ulcer, esophagitis, fecal discoloration, flatulence, gastric nodules/fundic gland polyps, gastroenteritis, gastrointestinal hemorrhage, hematemesis, increased appetite, increased salivation, melena, rectal hemorrhage, stomatitis, tenesmus, ulcerative colitis; **Endocrine System** - diabetes mellitus, goiter, hyperglycemia/hypoglycemia; **Hemic and Lymphatic System** - anemia, hemolysis; **Metabolic and Nutritional Disorders** - gout, weight gain/loss; **Musculoskeletal System** - arthritis/arthralgia, musculoskeletal pain, myalgia; **Nervous System** - agitation, amnesia, anxiety, apathy, confusion, depression, dizziness/syncope, hallucinations, hemiplegia, hostility aggravated, libido decreased, nervousness, paresthesia, thinking abnormality; **Respiratory System** - asthma, bronchitis, cough increased, dyspnea, epistaxis, hemoptysis, hiccup, pneumonia, upper respiratory inflammation/infection; **Skin and Appendages** - acne, alopecia, pruritus, rash, urticaria; **Special Senses** - blurred vision, deafness, eye pain, otitis media, taste perversion, tinnitus, visual field defect; **Urogenital System** - abnormal menses, albuminuria, breast enlargement/gynecomastia, breast tenderness, glycosuria, hematuria, impotence, kidney calculus.

Postmarketing

On-going Safety Surveillance: Additional adverse experiences have been reported since lansoprazole has been marketed. The majority of these cases are foreign-sourced and a relationship to lansoprazole has not been established. Because these events were reported voluntarily from a population of unknown size, estimates of frequency cannot be made. These events are listed below by COSTART body system.

Body as a Whole - anaphylactoid-like reaction; **Digestive System** - hepatotoxicity, vomiting; **Hemic and Lymphatic System** - agranulocytosis, aplastic anemia, hemolytic anemia, leukopenia, neutropenia, pancytopenia, thrombocytopenia, and thrombotic thrombocytopenic purpura; **Special Senses** - speech disorder; **Urogenital System** - urinary retention.

Combination Therapy with Amoxicillin and Clarithromycin

In clinical trials using combination therapy with PREVACID plus amoxicillin and clarithromycin, and PREVACID plus amoxicillin, no adverse reactions peculiar to these drug combinations were observed. Adverse reactions that have occurred have been limited to those that had been previously reported with PREVACID, amoxicillin, or clarithromycin.

Triple Therapy: PREVACID/amoxicillin/clarithromycin

The most frequently reported adverse events for patients who received triple therapy for 14 days were diarrhea (7%), headache (6%), and taste perversion (5%). There were no statistically significant differences in the frequency of reported adverse events between the 10- and 14-day triple therapy regimens. No treatment-emergent adverse events were observed at significantly higher rates with triple therapy than with any dual therapy regimen.

Dual Therapy: PREVACID/amoxicillin

The most frequently reported adverse events for patients who received PREVACID t.i.d. plus amoxicillin t.i.d. dual therapy were diarrhea (8%) and headache (7%). No treatment-emergent adverse events were observed at significantly higher rates with PREVACID t.i.d. plus amoxicillin t.i.d. dual therapy than with PREVACID alone.

For more information on adverse reactions with amoxicillin or clarithromycin, refer to their package inserts, **ADVERSE REACTIONS** sections.

Laboratory Values

The following changes in laboratory parameters for lansoprazole were reported as adverse events:

Abnormal liver function tests, increased SGOT (AST), increased SGPT (ALT), increased creatinine, increased alkaline phosphatase, increased globulins, increased GGTP, increased/decreased/abnormal WBC, abnormal AG ratio, abnormal RBC, bilirubinemia, eosinophilia, hyperlipemia, increased/decreased electrolytes, increased/decreased cholesterol, increased glucocorticoids, increased LDH, increased/decreased/abnormal platelets, and increased gastrin levels. Additional isolated laboratory abnormalities were reported.

In the placebo controlled studies, when SGOT (AST) and SGPT (ALT) were evaluated, 0.4% (1/250) placebo patients and 0.3% (2/795) lansoprazole patients had enzyme elevations greater than three times the upper limit of normal range at the final treatment visit. None of these patients reported jaundice at any time during the study.

In clinical trials using combination therapy with PREVACID plus amoxicillin and clarithromycin, and PREVACID plus amoxicillin, no increased laboratory abnormalities particular to these drug combinations were observed.

For more information on laboratory value changes with amoxicillin or clarithromycin, refer to their package inserts, **ADVERSE REACTIONS** section.

OVERDOSAGE

Oral doses up to 5000 mg/kg in rats (approximately 1300 times the recommended human dose based on body surface area) and mice (about 675.7 times the recommended human dose based on body surface area) did not produce deaths or any clinical signs.

Lansoprazole is not removed from the circulation by hemodialysis. In one reported case of overdose, the patient consumed 600 mg of lansoprazole with no adverse reaction.

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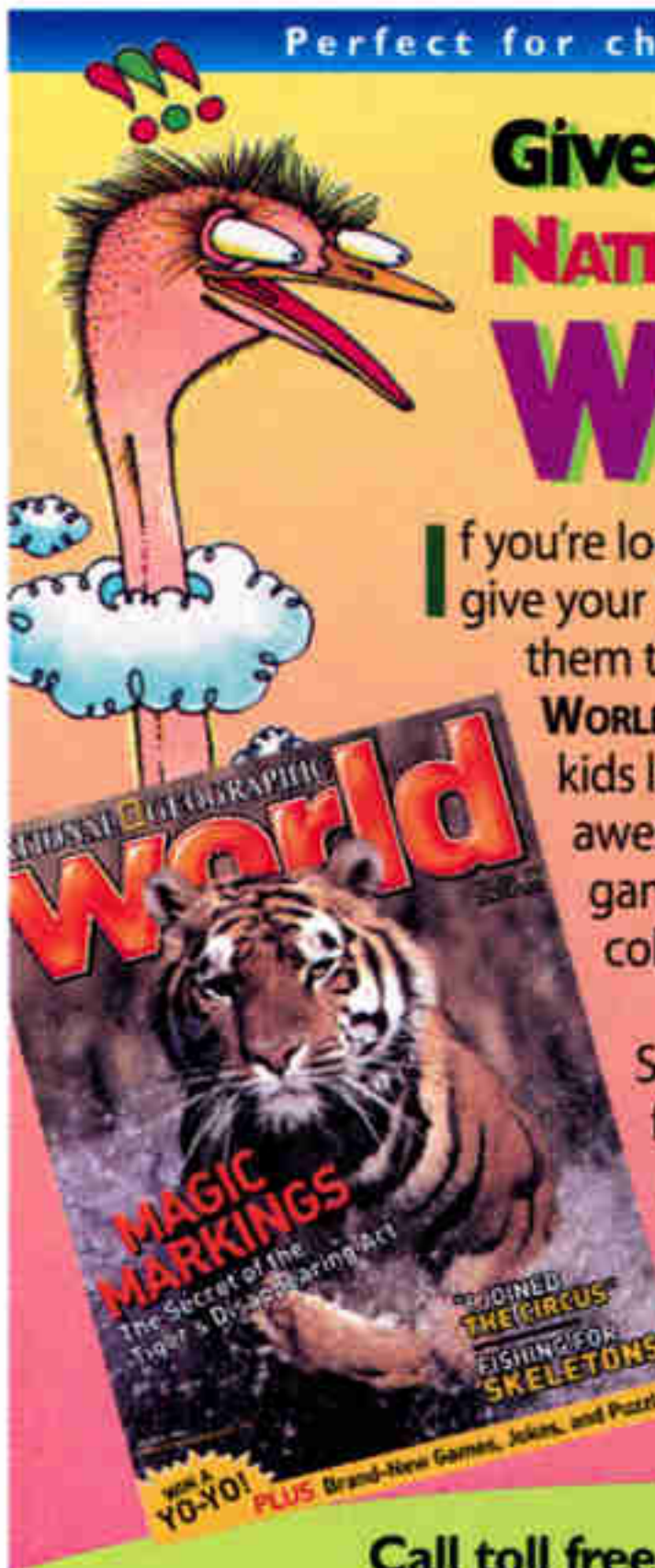
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Severed Past

Declaring his warrior pedigree, an Iban tribesman from Sarawak, a Malaysian state on the island of Borneo, exhibits an enemy head. *Forbidden Rites*, a three-part presentation, looks at the history of head-hunting, cannibalism, and human sacrifice in cultures ancient and modern. The films reveal that such practices, though officially discouraged, still exert a powerful force in many groups that once engaged in them.

DAVID ALAN HARVEY

NATIONAL GEOGRAPHIC
EXPLORER, CNBC

Lost World

Sulfurous clouds rise from the hot, caustic waters of Lake Bogoria in Kenya's Rift Valley. Seemingly inhospitable, the waters can host hundreds of thousands of nomadic flamingos dependent on algae growing in the shallows. *Gates of Hell*, an EXPLORER premiere, documents a year in which something goes infernally wrong in the lake's annual cycle. Scores of flamingos mysteriously die, weakened by a variety of conditions, including pollution; troops of baboons, which normally show little interest in the birds, turn into savage predators. A project of the award-winning natural history unit of National Geographic Television, *Gates of Hell* shows in spectacular fashion how nature fights to regain its fragile balance.



MICHAEL BUSSELLE, TONY STONE IMAGES

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Ask Us



RICHARD OLSENIUS

THE ANSWER PLACE

Our Research Correspondence staff responds to questions from curious readers.

Q For whom is Angel Falls, the highest waterfall in the world, named?

A The 3,212-foot Venezuelan waterfall is named for Jimmy Angel, a U.S. aviator who reported seeing it in 1935.

Q What is the origin of the saying "Red sky in morning, sailors take warning; red sky at night, sailor's delight"? And does it describe an actual weather condition?

A The origin of the saying is unknown, although a form of it appears in the Bible (Matthew 16:2-3). It has some basis in science and is a fairly good

predictor—though no guarantee—of weather at midlatitudes in the Northern Hemisphere, where storm systems generally follow the jet stream from west to east. A red sky in the morning indicates a sun rising in clear eastern skies casting its rays on storm clouds approaching from the west. At night the clear sight of the red setting sun would tell a sailor that no storms are to the west.

Q What protects a ram's brain during battle?

A Rams have horns made up of keratin surrounding a core of bone. This core and the double-layered skull contain cavities with reinforcing struts and girders that allow rams to absorb the impact of head clashing without injury to the brain.

TELL US

How can a forest of place-name signs—most of them from distant locations, some thousands of miles away—still tell a traveler exactly where he is?

Think you know the answer? Go online to nationalgeographic.com/ngm/tellus/0106 and test yourself, or read it here in next month's issue.

May Answer The bicyclist balances a load of plastic foam encased in netting. The oversize delivery is probably destined for a nearby recycling center in Guangzhou, China.

MORE INFORMATION

Send questions to Ask Us, National Geographic Magazine, PO Box 96095, Washington, DC 20090-6095 or via the Internet to ngsaskus@nationalgeographic.com. Include name, address, and daytime phone number.

Braving gale-force winds and icy rain, a team of scientists, adventurers, and one intrepid photographer discovers new caves at the end of the Earth.





DEEP
INTO
THE
LAND
OF

EXTREMES

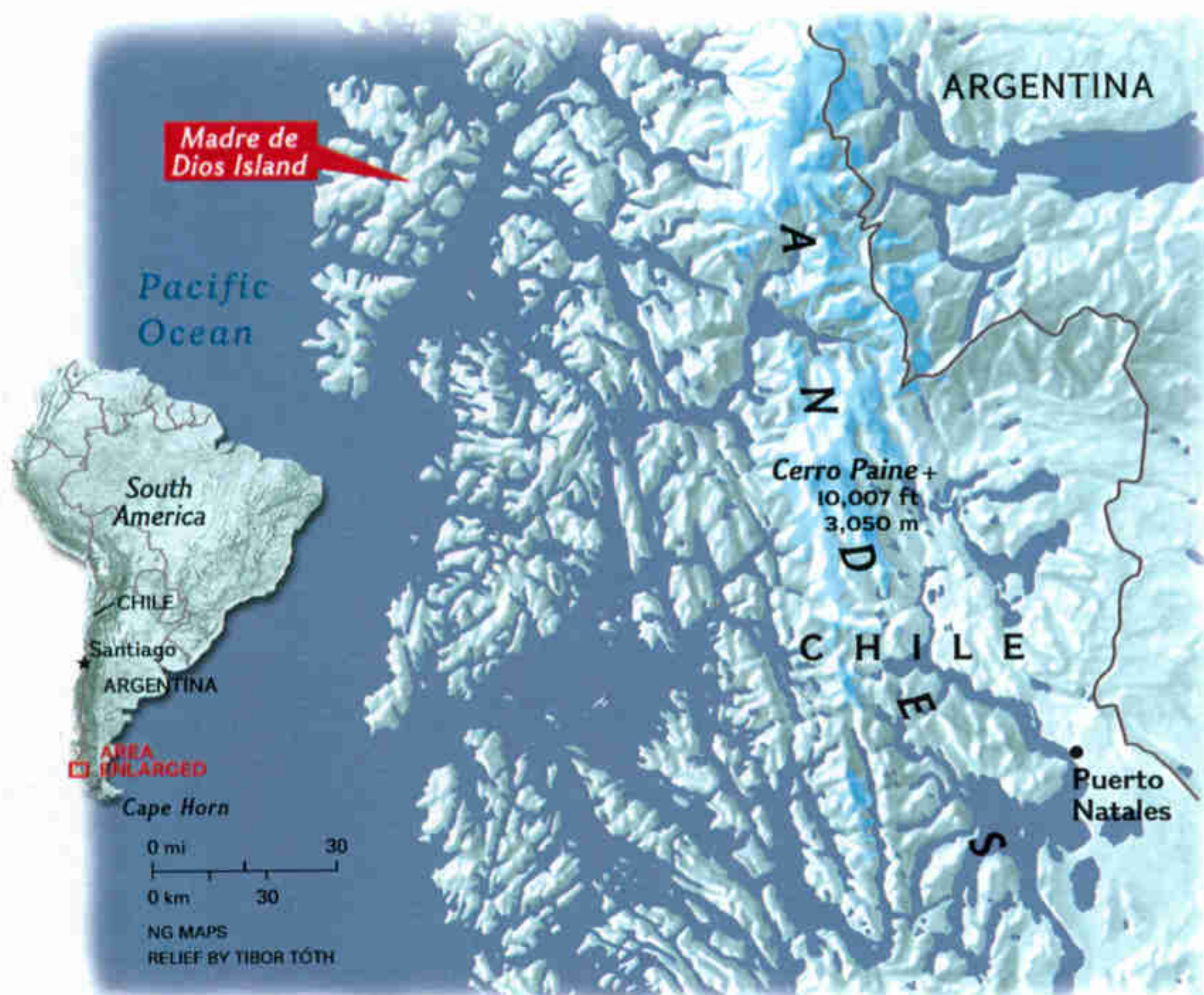
PROBING CHILE'S
WILD COAST

ARTICLE AND PHOTOGRAPHS BY CARSTEN PETER

Though I'd never seen the coast of southern Chile, I'd heard for years that this part of the country was one of the most hostile, and beautiful, places on Earth. So I jumped at the chance to join an expedition of two dozen scientists and explorers boating 700 miles down the western coast of South America. Our destination was Madre de Dios (Mother of God) Island, a bleak, uninhabited 450-square-mile bolt of rock blasted by a maelstrom of heaving seas, winds, and torrential rain. Despite these conditions the island was paradise to the French leaders of our expedition, speleologist Jean-François Pernette and geomorphologist Richard Maire, who'd first seen it during a trip to the region in 1997. Unable to land because of storms, they had recognized from a distance that much of Madre de Dios was karst, or exposed limestone, which meant that it was probably riddled with shafts and crevices. Experts on caves and karst formations, Pernette and Maire wanted to explore

SOCIETY GRANT

This Expeditions Council project was supported by your Society membership.



WORK IN PROGRESS

Carved by blistering wind and rain, the limestone on Madre de Dios makes for bizarre sculpture, says geomorphologist Richard Maire (above). "Erosion here is as fast as anywhere in the world. You can almost see the rock disappear before your eyes."



further. After arriving we spent nearly every moment either making new discoveries or dealing with small catastrophes, from a failing generator to a leak in the hull of the rented fishing vessel we lived on. My own catastrophe occurred several weeks later when I fractured my right foot in a caving accident. Yet my injury had beneficial side effects: Forced to sit still, I had time to reflect on what an astonishing place we'd come to. Madre de Dios is breathtaking, a realm of magical shapes etched by furious forces of nature. Far from the world we know, it is among the last of the untouched places, where moss and stone have a life of their own.



A GLIMPSE OF SUN Cause for celebration on the coast of Chile, a break in the weather illuminates fjord-rimmed islands that meet Pacific storms head-on. In 1520, after navigating the strait later named for him, Magellan cruised by this lightly populated coast, as close to Antarctica as it is to Santiago.







NIGHTMARE IN GREEN First we hit land, then we hit an obstacle course—a dense rain forest, the kind you’d expect to find in tropical latitudes rather than in the furious fifties approaching Antarctica. An average precipitation of 25 feet a year spawns a mad profusion of mosses, lichens, and a stunted forest of southern beech trees that reminded expedition members of bonsai. As cave diver Michel Philips (right) discovered, every inch of this forest is slippery and green. In one backwater pool algae drape the fallen trees like mushy ghosts (above), while a thick cushion of moss blankets everything from tree limbs to boulders (left). We uncovered the treacherous side of this fantasy forest when we crossed it in search of caves. Hidden by the vegetation, the rock below was riddled with sinkholes and shafts. We traversed the forest dozens of times, often twice a day, but we never took the trip lightly.



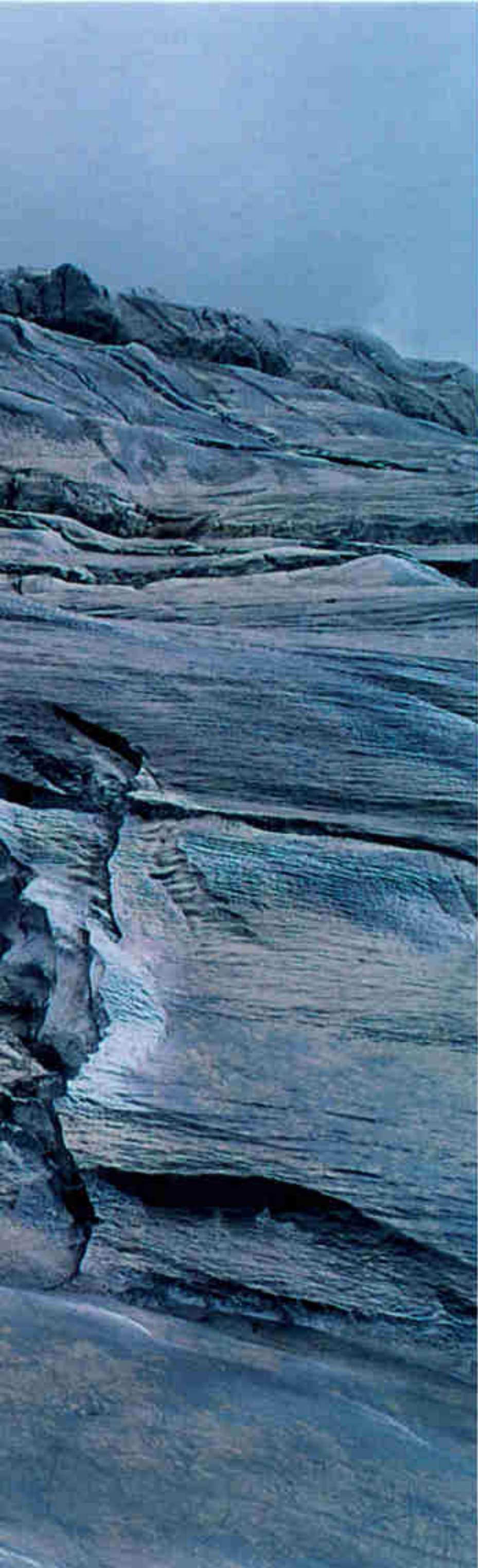


STUBBORN SURVIVORS On the windswept heights of Madre de Dios, mosses and other simple plants succeed by keeping a low profile and working their way into the limestone's crevices. Sheltered from the worst of the Pacific winds, the island's tangled forest clings to rocky hillsides.



GLACIERS OF STONE Inspired by the subpolar weather, I came to think of the island's marble plateau as a series of rugged glaciers. In reality it is the remnant of a coral reef system laid down between 260 and 315 million years ago in a calm, tropical sea. High on the island, above the forest, sprawled a scene nearly devoid of color—creviced rock rendered in a thousand shades of gray, constantly changing before our eyes like a mirage. Fat drops of rain would fall, splattering light gray rock with dark leopard spots or zebra stripes, followed by driving sheets of rain that would slash across the rock and turn it dark and shiny as coal. Then the wind would rise and parts of the exposed rock would dry for a moment, turning white, only to be soaked black again.





BERNARD TOURTE



It rained like this practically every hour on Madre de Dios, punctuated by occasional bursts of sleet or hail—a furious bombardment of pin-pricks that made you want to clap a bucket over your head.

The icy wind, which howled in our ears and shook our legs, was so strong that whatever fell from the sky came at us sideways. High-velocity wind and rain had even blasted away the exposed rock and left little wedges of limestone (top) trailing from the leeward side of volcanic rock fragments deposited by glaciers. “This kind of erosion feature has never been seen before,” said our lead geomorphologist, Richard Maire. “These karst islands are like a natural laboratory with a built-in wind tunnel.” He estimates the rate of erosion at six millimeters a century, one of the fastest rates on Earth. The weather that carved such forms whittled away at us too. Our defense was to laugh whenever possible at little absurdities, like the futility of waterproof gear (above).

PLUNGING AHEAD On a typical foray speleologist Alan Warild rappels from the forest into a cave entrance below. “This may be the most difficult caving spot on the planet,” says expedition leader Jean-François Pernette. Though lush, the island is nearly devoid of animal life.







STONE-COLD BEAUTIFUL In the end team members collected sweet rewards for their grueling journey. “The second we went underground I forgot how miserable we were,” says Richard Maire. More than 1,200 feet deep, this cave becomes a waterfall in a downpour.



FEAR OF FLOODING Beneath the nightmare forest and the glaciers of marble we found what we'd come for: the caves. In keeping with everything else on Madre de Dios, these were the wildest caves imaginable—raw, scoured pipes in the earth shaped not



by slow and steady trickles of groundwater but by torrents and flash floods so violent that they chiseled the cave walls as though they were made of ice (right). The deeper we went, the tighter the knot in my stomach became. Cut off from sounds on the surface, we had no idea whether it was raining

outside or not—a terrifying prospect, since any one of the island's trademark storms could send rivers of rainwater plummeting down on us without warning. These caves were slick and bare





with no side chambers in which to hide; we knew that in a downpour they would quickly flood. Would we drown, I wondered, or would we die from falling as we were flushed down a slippery tube? I was searching for a place to take cover when the stone wall I was clinging to suddenly broke off, hurling me backward to the cave floor and injuring my foot. My scream brought my friends to the rescue, and I left Madre de Dios in a fitting manner—hobbling on a crutch made of a wind-gnarled branch and soaked to the skin. For the final few days the rest of the team continued to explore, study, and map the island, while I, immobile, reflected on the strange and violent beauty we'd found in this land of extremes. □

MORE ON OUR WEBSITE

See more photos of windy, wet Madre de Dios and learn how the weather challenged the photographer at nationalgeographic.com/ngm/0106.

MORE THAN TWO YEARS INTO A JOURNEY THAT BEGAN IN 1271
IN DISTANT VENICE, MARCO POLO REACHED THE TOWERING
DUNES OF CHINA'S TAKLIMAKAN DESERT, RIDING CAMELBACK
AS VISITORS STILL DO. MARCO SPENT 17 YEARS IN CHINA,
RETURNING WITH TALES TO ASTOUND THE WESTERN WORLD.

MARCO POLO

PART II
I N C H I N A

By MIKE EDWARDS
ASSISTANT EDITOR

Photographs by
MICHAEL YAMASHITA







Ganged up against the cold, Tajik children, members of a Muslim minority in western China, review tattered notes before school opens in a Pamir mountain village in Xinjiang.



Marco followed the Silk Road through this well-trod region. "From this country," he wrote, "go out many merchants . . . through all the world doing trade."

IN THE TAXKORGAN RIVER VALLEY in farthest western China, the home of Bibi Mu crouches low upon the earth, its mud walls almost invisible in the bleak end-of-winter landscape. A few miles to the west an ancient track drops into the valley from the snowbound heights of the Pamir mountain range. On this route probably came, in the year 1274 or early 1275, the small caravan of Marco Polo, his father, Niccolò, and his uncle, Maffeo. After struggling across the Pamirs from what is now Afghanistan, they were surely half-starved, and I'd guess that they stopped at a house like Bibi Mu's seeking food.

Maybe the Polos were escorted into a low-ceilinged room with bright carpets on the floor and more carpets on the walls, as I was escorted by Bibi Mu. The matriarch of her family, she reckoned her age in the 70s and had skin burned to leather by sun and wind. On her hands were five rings with worn stones of red and green. The elder Polos would have noted those; jewelry was their business. And Marco, who was 20 or 21, would have feasted his eyes upon the handsome dark-eyed granddaughters who brought disks of nan and bowls of hot sheep's milk with tea.

Such, I think, was the welcome the Polos received at this threshold of modern China. Their real threshold was months away: Here it was cold and treeless, and the people spoke Persian and Turkic languages, for most had Central Asian roots. Moreover, in the 13th century this territory had been swallowed by the vast Mongol Empire. But every step brought the Polos closer to the great cities of the Chinese East, rich in silk and spices and jewels, the tantalizing stuff of Marco Polo's book, *The Description of the World*.

Guided by that account, photographer Mike Yamashita and I had traced Marco's journey through Iran and much of Afghanistan.* Now we would follow him as he rode 2,600 miles from the wastes of China's Xinjiang region

*See "The Adventures of Marco Polo," NATIONAL GEOGRAPHIC, May 2001.

The rising sun beckoned Marco ever eastward. His party, which included his father and uncle, both merchants, passed near Jiayuguan, where a 14th-century tower on the Great Wall marks a traditional entryway to China.

"This great Kaan is the most powerful man in people and in



to Shangdu (also known as Xanadu), the sumptuous summer capital of the Mongol ruler Kublai Khan, and then to the new city Kublai was building—Daidu, today part of Beijing.

During Marco's 17 years in China, Kublai employed him as a trusted courier and sent him afar, Marco wrote, giving him the opportunity to explore "more of those strange regions than any man who was ever born." That's a big boast. But, in fact, no other European had seen so much of China.

As I followed his track into "those strange regions," I found that many of the customs that intrigued him still survived. In Yunnan Province, for example, he reported on people who dined on raw flesh; I ate with them one day. In eastern China I looked up his old haunts, such as Yangzhou, where he claimed to have been governor, and elegant Hangzhou, which in Marco's time was the world's largest city; with 1.5 million people it was 15 times as populous as his native Venice.



DESCENDING from the cold Pamir flank, the Polos faced a different challenge. They were at the edge of the vast Taklimakan Desert, whose name means something like "go in and you won't come out." Marco seldom reports on the Polos' means of transport, but in this bitter and windswept realm, where precipitation is half an inch a year—if that—they were most likely plodding along on double-humped Bactrian camels at the anesthetic rate of 15 miles a day.

lands and in treasure that ever was in the world."

A sinew of asphalt traces part of their route now, skirting the Taklimakan's southern rim and tying together a string of infrequent oases. I bumped along this road in an air-conditioned cocoon, an SUV. For the first couple of hundred miles I crossed great shingles of gravel, a kind of desert the Chinese call *gobi*. The sand that once mingled with those stones lies today in the next county to the east, or beyond, borne off by the wind. Ahead on the road appeared a fringe of poplars, the windbreaks of a town. Marco seemed amazed by the provender of such oases. He wrote of one, "They have great abundance of all things." Ancient irrigation channels still nurture the farmlands with snowmelt from the Kunlun mountain range, a faint gleam far to the south.

But as the Polos plodded on, rivers and oases became scarce and sand dunes rose ever higher, until they looked like mountains. The toughest stretch of their desert journey was at hand, where "nothing to eat is found" and "you must always go a day and a night before you find water." The Polos loaded a month's supply of food for themselves and their animals. They probably hired a couple of cameleers to help with their pack string, and perhaps they joined a caravan of traders who knew the location of water holes.

There is a sensuous allure in the curving, swelling architecture of dunes. They are also deceitful. One day I was sure I saw a great lake ahead, with boats. Just mirages, of course. But a traveler half-crazed by thirst could go fatally astray while pursuing such a vision. Marco wrote of spirits that could lure away a straggler, calling him by name in voices that sounded like his



Freak snowstorm in arid western China enchants factory workers on a break near Kashgar. China presented Marco with many marvels: “black stones”—coal—that burn, cities



larger than any in Europe, wine made from rice, and the discovery that asbestos comes not from a salamander, as medieval Venetians believed, but from a mineral.



companions'. "It often seems to you that you hear many instruments sounding," he also wrote, "and especially drums."

Practical men say these eerie sounds are produced by moving sand or by wind in the dunes. "The old people believe they are hearing devils speak," said a farmer at an oasis. He rejected this as superstition but confessed, "One night I heard, three times, a terrible noise, like crying, like someone dying."

I went to this oasis, named Nanhu, with a small, indefatigable historian, Li Zhengyu. We traveled together for about two weeks while I soaked up his encyclopedic knowledge of the Silk Road. "The Polos certainly stopped to water here," he said at Nanhu's springs, conjuring a picture of Marco leading camels to drink. And then Professor Li led me to the ruins of a town, almost buried in dunes. To judge by the visible walls, it had been about the size of two football fields. "This was Shou Chang Cheng, an outpost of the Han dynasty that was mentioned in records in 110 B.C.," he said. "Marco Polo must have spent the night within these walls—there was no other town for miles."

By now the Polos had traveled perhaps 1,300 miles in China—about half the way to Shangdu—and had put the dreaded Taklimakan behind them. In what is now Gansu Province they reached Shazhou, a hub of trade routes, and Marco entered a new world, mingling for the first time with large numbers of Chinese, as well as Mongols and a local people related to the Tibetans, the Tanguts. Most, Marco wrote, were "idolaters. . . they have many abbeys and many monasteries which are all full of idols of many kinds, to which they do great sacrifice and great honor." Shazhou, now named Dunhuang, was one of China's greatest Buddhist centers.

Though the old monasteries no longer exist, in a cliffside are nearly 500 grottoes crammed with statues and paintings, many dating from the sixth or seventh centuries. Did Marco crane to see the face of the Buddha rising 85 feet in one of these niches? Did he stand before the reclining Buddha that stretches 52 feet amid a phalanx of 72 smaller statues? Later in his travels

Crossing into a Buddhist realm, Marco provided an early account of Asia's great monasteries and temples. His interest extended to Burma and its capital of Pagan (above), with "the most beautiful towers in the world." His China route led past the Mogao caves near Dunhuang, where a mural (right) depicts foreigners mourning the death of Buddha.



Marco admired monks and wrote that the Buddha, had he been Christian, would have been a saint. But he ignored Shazhou's grottoes. Maybe he didn't see them. Or maybe, beholding such a panoply of strange religious art, he was simply overwhelmed.

He was more comfortable writing about material things, such as fire-proof cloth. "I saw them myself," he said of the fibers, which were asbestos. Europeans believed such fibers came from an animal—a *salamander*, yet—that lived in fire. Marco learned they were mineral, mined in China.

Another subject that got Marco's attention: sex. In a province near his route, he said, if a stranger comes to a man's house to lodge, the man "tells his wife to do all that the stranger wishes. . . . And the stranger stays with his wife in the house and does as he likes and lies with her in a bed." The women, he added, are "fair and gay and wanton."

Marco did not reveal how he knew this. But historians say the report rings true. "Minority peoples had this custom," Professor Li said. "They thought outsiders were distinguished and would bring their family new blood and a better future."

Sometimes, as Professor Li and I followed the old Silk Road through Gansu Province, we were in sight of a wall—miles of it. Critics who doubt that Marco reached China, who believe he merely collected other travelers' tales, cite as evidence his failure to mention the Great Wall.

Chinese scholars, who generally hold Marco in high regard—he was, after all, the greatest PR man China ever had—call this argument absurd. As they point out, *the* Great Wall that all the world knows about, with sides and parapets of brick and stone, didn't exist in Marco's time; it was built after the Mongol dynasty was overthrown.

"What you're seeing is a wall built by the Han dynasty about 1,400 years before Marco came," Professor Li said of the packed earth construction that our highway followed. "It protected the Han territory from nomadic raiders." Originally it was about 30 feet high; parts still rise to 10 feet today.

By Marco's time it had long been abandoned; hence he had no reason to mention it. Perhaps he omitted walls because they were commonplace. Many cities of Europe were walled, as were many he had seen in Central Asia.

One morning as we cruised along in our SUV, Professor Li began to sing a song that I remembered from Sunday school:

*Jesus loves me, this I know,
For the Bible tells me so. . . .*

"I went to a missionary school for 12 years," he said. "And I was baptized."



Hands-on wrangling speeds a round-up on the plains of Inner Mongolia. The high place of horses in Mongol life reached to the court of ruler Kublai Khan. Marco, a favored courier, reported that Kublai once received as a gift "more than 100,000 white horses very beautiful and fine."



The missionaries left after the Communists came to power in 1949. Later, as a critic of government policy, Li spent years at hard labor and as a peasant before being “rehabilitated” and allowed to teach.

“It’s been a long time since I sang Christian songs aloud,” he said. “But sometimes I sang them in my heart.” He started “Holy, Holy, Holy!” and I joined in. Next, “Silent Night.” It was a right good choir practice we had while cruising the Silk Road at 60 miles an hour. We both cried a little.

In the towns on our route—Anxi, Yumen, Zhangye—night brought crowds to small cafés where the wheat stretcher, the *lamian de*, performed. I watched a young man named Tang as he massaged a lump of dough, then drew it out to a length of about five feet. Then his arms flexed, his fingers twitched in cat’s cradle maneuvers, and suddenly the dough strand doubled, then quadrupled and octupled. Tang flipped the noodles into a bubbling cauldron and minutes later dipped out a bowl of soup—pasta, chilies, greens, a bit of meat. It made a 20-cent supper.

Noodles, ancient Chinese fare, are so popular today that schools teach

the stretching arts. Some stretchers claim they can craft ten shapes, from half an inch wide down to “silk hair” and even triangular noodles.

Marco must have seen wheat stretchers at work. One version of his book—there are about 150 versions, owing to the many scribes and printers who added, subtracted, and mistranslated—declares that the Chinese do not make bread from their wheat but eat it “only as macaroni and other viands made of dough.” That doesn’t mean Marco took pasta home to Italy, as has been claimed. Italy already was eating noodles.

Marco’s doubters have taken aim at him at table: If he really went to China, why didn’t he mention tea and chopsticks? By the evidence of his book, for drink he preferred something stronger. He invariably mentions, and frequently praises, local firewaters, made of everything from grapes and dates to mare’s milk and palm tree sap. I conclude he simply found tea uninteresting. As for chopsticks: Marco spent much of his time with other foreigners. When dining with Mongols or Persians, he probably used a knife to slice meat and ate everything else with his hands, as they did.

News of the Polos’ approach sped along Kublai Khan’s pony express message system, and from his summer capital at Shangdu the monarch sent envoys to escort the travelers when they were still 40 days distant.

Shangdu stood in a wide, shallow valley in what is now Nei Mongol—Inner Mongolia. The Polos had journeyed from Venice “quite three years and

a half” to kneel before Kublai. He was, Marco told Europeans (who knew next to nothing of him), “the most powerful man in people and in lands and in treasure that ever was in the world”—probably not an exaggeration.

As Marco recounts the first audience at court, Kublai was an unmagisterial Mister Congeniality, spouting pleasantries: Welcome, gentlemen! Please stand up. How’ve you been? How was the trip? In fact, Kublai probably considered it a great honor that Europeans—rare in China—had made the arduous journey to his court.

Niccolò and Maffeo already had traveled once to Kublai’s empire, and the monarch had asked them to return with a hundred wise men to preach Christianity. Like his grandfather, Genghis Khan, Kublai was generally tolerant of all faiths; quite a few of his kin were Christians of the eastern Nestorian sect.* Kublai surely was disappointed to hear that the church had not provided the hundred wise men. But at least the Polos had fulfilled his other request, bringing oil from Jesus’ sepulchre, considered a powerful elixir.

Marco estimated Shangdu’s square city wall at 16 miles around, presumably using Venetian miles, slightly longer than today’s. Chinese archaeologists told me the wall was much shorter—only 5.5 statute miles. Within were monasteries of “idolaters,” mainly Buddhists, who provided Kublai with astrologers and sorcerers. Only rubble remains; Shangdu was destroyed after Kublai’s dynasty was overthrown in 1368.

Still, walking on the rumbled earth, kicking up chips of glazed roof tile, I didn’t find it hard to imagine the halo cast up by



“In the other world the dead man will have as many slaves

Shangdu’s fountains and shining constructions. Marco saw a bright marble palace and described an enormous collapsible building, where Kublai reportedly presided at three-day bacchanals. This one also must have shone, for it had roof tiles made from large pieces of bamboo, split in half and varnished.

About the time the Polos arrived in Shangdu, Kublai was finishing his new capital 200 miles southeast at Daidu, in the central part of today’s Beijing. Marco admired Daidu’s streets “so straight and so broad,” still the capital’s layout. Homes were heated with “black stones . . . which burn like logs.” One version of Marco’s book says that coal—unknown in most of Europe—was so plentiful that everyone had a hot bath three times a week. Daidu’s population, said Marco, could be estimated from the number of prostitutes: 20,000.

He was fascinated by the paper money issued by Kublai, for paper currency also was unknown in Europe. One day in a coin shop I held a sheet of Kublai’s cash. It was about the size of a page of typing paper and had the slightly furry look of felt. Marco wrote, correctly, that the paper was made from the ground-up inner bark of mulberry trees. The note in my hand had the value of “two strings,” meaning 2,000 coins of a certain worth. “All these sheets are sealed with the seal of the great lord,” Marco wrote, his only reference to Chinese printing.

Kublai’s palace buildings in Daidu gleamed like Shangdu’s; their glazed roof

*See “Lord of the Mongols, Genghis Khan,” NATIONAL GEOGRAPHIC, December 1996, and “Sons of Genghis, the Great Khans,” February 1997, both by Mike Edwards.

tiles, “red and green and blue and yellow . . . are bright like crystal, so that they shine very far.” Two decades ago, when I first saw Beijing, it was one of the darkest capitals of the world. But in recent years the shining palace syndrome has run riot in tall buildings that proclaim China’s vigorous economy. Windows tinted pink, blue, or green vie with walls of multicolored ceramic tiles, giving a Kublaiesque sheen to Beijing and other cities great and small.

Daidu became the Polos’ principal home until their departure for Venice in 1291. We don’t know how Niccolò and Maffeo spent their time; some Chinese historians say they may have become merchants in companies in which Kublai or other officials invested. As for Marco, according to the book, Kublai employed him as a courier not only in China but to other Asian kingdoms. He employed thousands of foreigners, especially Persians and Arabs, as administrators. These *se mu*, or “colored eyes,” ranked below Mongols in Kublai’s dynasty, but above Chinese officials, who were not trusted.

IN THE 19TH CENTURY, when it became possible for foreigners to travel freely in China, diplomats, missionaries, and adventurers tested Marco’s presumed travel routes. They didn’t always find him easy to follow, in part because he often called cities and other features by Persian or Mongol names. Thus Marco says he crossed a river named Caramoran. That was a corruption of Kara Muren, the Mongol name for the Huang Ho, or Yellow River. The great city of Xian appears in Marco’s book as Quengianfu, a corruption of the Persian Kinjanfu.

Marco spoke Persian and probably Mongol, but scholars conclude that he did not master Chinese and probably spent little time with people who spoke it. Some scholars have argued that he did not travel much in China—that he “borrowed” reports on faraway regions from officials or merchants.

I, too, sometimes doubted Marco, with reason. Several times he revives the

Paper money fascinated Marco as much as gems and spices did. He marveled at the “alchemy” that permitted the Great Khan to print paper money equal in value to gold and silver. He also noted the practice of burning fake money to honor the dead, a custom still alive in China.

and as many beasts . . . as they have paper ones burnt.”

old legend of Prester John, a mighty Christian ruler in Asia who never existed. Then there was Marco’s mangonel story. When Kublai invaded the territory of the Southern Song dynasty, his army besieged the city of Xiangyang but met strong resistance. Marco says the Polos came to the army’s aid by producing three mangonels, or catapults, that could hurl 300-pound stones, and with these the army forced the city’s surrender. This tale overlooks two facts: The Mongols already knew how to make mangonels, and the surrender of Xiangyang took place two years before the Polos got to China.

And anyone would look askance at some tales Marco recorded in Yunnan Province. Around the city of Dali, for example, was there really a giant snake with legs and a mouth “so large that it would well swallow a man”? I asked Shi Lizhuo, the editor of a local magazine, about that. “Marco heard the story from the local people,” he answered. “According to legend there was a huge snake with legs here—a snake, not a crocodile—that ate people.”

Marco also claimed that people here dined on raw flesh, including that of fowl, sheep, oxen, and water buffalo, which they eat “as well as we do the cooked.” Any doubts I may have had about that evaporated in a village near Dali where I watched a hundred persons sit down to feast on raw pork.

The people were Bai, one of Yunnan’s minorities, and they continued the tradition. “We eat this on special occasions,” said the host, Li Ming. Li’s son, Xiaole, was marrying his lifelong friend, Bizhu. So the Li family festooned their yard with pine garlands, invited the neighbors, and killed four hogs.



Monks of the Yellow Hat sect of Tibetan Buddhism flock together prior to morning prayers at the Labrang Monastery in Xiahe in Gansu Province, a region populated by



“idolaters,” the Christian Marco wrote. Monks intrigued Marco with their fasting, their shaved heads, their “moon calendar,” and the way they “lead life hard.”

Raw meat was “minced small,” Marco wrote. Indeed the butchers at the Li home practically shaved it from the carcasses. Then, wrote Marco, “they put it in . . . garlic sauce mixed with good spice.” The Li family’s sauce combined garlic, chilies, and soy.

As the guests sat down, trumpeters and cymbalists played noisily to drive off any evil spirits that might be lurking. I wondered if they could drive off trichinosis. “The meat is clean,” Li Ming assured me. “Early this morning we sent samples to the health clinic for testing.” Inquiring no further, I took my place among the guests, fished out a pink morsel, dipped it in sauce, and ate. What, you ask, does raw pork taste like? Like garlic, chilies, and soy.

MARCO TRAVELED the Southwestern Silk Road, as the Chinese now call the ancient route wiggling through mountainous southwestern Yunnan. To Americans it’s famous as the Burma Road, the supply line for United States and Chinese forces fighting the Japanese in World War II. I left Dali on that route late of an afternoon in a hired van. For a while we paralleled the Mekong River—just a trickle of its future self—on new pavement. But as the road began to twist and climb, the pavement ran out, and we were rumbling over cobble, hand-laid in precise rows. Corn-ear pavement, the Chinese call it.

Ahead, truck headlights spiraled from a mountainside of switchbacks. I imagined the trucks were GMCs and Internationals taking supplies to the Chinese Army in the dark days of the war, when Japanese forces were steadily advancing, and the Burma Road was China’s only land lifeline. In truth, the trucks were Dong Fengs, or East Winds, China’s workhorses. Heavily loaded, they groaned up-mountain and went down with brakes smoking. Sometimes in our headlights I saw a driver pouring water on his wheels to cool them off.

Finally we were in the territory that Marco, using Persian, called Zardandan—“gold teeth,” where the people “all have teeth of gold.” He almost certainly was among another Yunnan minority, the Dai. I went looking for them, veering off the Burma Road on a thread of asphalt that slipped between plots of cabbage and sweet potatoes. Presently I was in the village of Xian Duo. Beside the stone walls of its houses, streams of water sparkled in the sun, giving equal pleasure to children and piglets.

The first person I met was a woman in her 40s carrying two baskets of fertilizer on a shoulder pole. I asked if I might look into her mouth. Qian You-ai obligingly gave me a smile that revealed two gold incisors. “When I was about 18, people thought gold teeth were beautiful,” she told me. “A dentist came to the village and took out two of my teeth and put these in. But it’s not being done now—people don’t think it’s beautiful anymore.”

One version of Marco’s book added that the gold-teeth people also decorated themselves with tattoos; using “five needles joined together . . . they prick the flesh till the blood comes, and then they rub in a certain black coloring stuff.” In Xian Duo I also asked about this, and in a few minutes several men good-naturedly stripped off their shirts to show me tattoos of tigers and elephants and adages in the curly Dai script. “Tattoos identify you as being Dai,” explained a man named Wan.

Marco’s chapters on Yunnan also describe shamanistic healing practices, local religious customs, and the use of cowrie shells and salt as money, all of which have been verified by scholars. “He could not have written so many interesting things about Yunnan if he had not been here,” declared Professor Fang Ling Gui, a retired historian from Yunnan Normal University in Kunming, the provincial capital.

“Each day there come . . . more than a thousand carts loaded with silk,” wrote Marco about how the prized cloth poured into Kublai’s capital on the site of modern Beijing. Countryside silkmaking has changed little since Marco’s time. Villagers still cook silkworm cocoons until they are soft enough to yield threads.





A mud remnant of the Great Wall, built to keep barbarians out of China, now deters only sheep on the southwestern edge of the Gobi desert. The fact that Marco never mentioned the



Great Wall causes some scholars to doubt whether he reached China. Marco's supporters counter that in the 13th century the unimposing state of the barrier made it easy to ignore.

MARCO probably spent most of his 17 years in China in eastern regions, where great cities throbbed with industry and commerce. These were the richest precincts of the world in the latter 13th century, and Marco describes them with wonderment: "There are very great merchants who do great trade . . . they have silk beyond measure." For a pittance you could buy "the most beautiful vessels of porcelain, large and small."

Many of these cities were strung along the Grand Canal, which stretched a thousand miles south from Daidu to Hangzhou. Marco journeyed along the canal, marveling at the variety of merchandise—silk, spices, salt, grain—carried in its vessels. Busier than ever, it is crowded today with barges that still carry silk and grain, and also cement and coal.

At the old port of Guazhou, where the canal meets the Yangtze River, scores of barges waited to enter a lock to be lowered ten feet. A young woman stood at the prow of one, and when I called "Ni hao—hello," she put down a ladder. Shen and her husband, Gong, were en route to Suzhou to load 300 tons of coal. Their four-year-old son, Tang, hopped nimbly among the idled vessels, a small flash of orange in his life jacket.

Gong joined us astern in the wheelhouse. Behind the wheel were sleeping pallets and a small television. A coal brazier blazed red, heating water in a kettle. A kitten was there too, tethered on a string.

"My parents and Shen's parents were boat people," Gong told me. "But we went to school on land. When our son is older he will go to school on land too." Shen added, "He'll live with my parents. Both of us will keep working on the boat. We took out a big loan when we bought it, and we want to pay the bank as soon as we can."

"We work for ourselves," Gong added, his voice booming with pride. "That's what's good about this life—you're free, you can do anything." The boat cost \$24,400, a fortune in China. But many boat families do well, earning several thousand dollars a year.

In Yangzhou people say Marco arrived via the canal and disembarked at the city's east gate. There is no gate now—it came down with the last of the city wall in the 1950s—but East Gate Road still links the canal to the downtown. Perhaps Marco walked that old thoroughfare at dusk, which is the time that I happened to be on it. Maybe he was attracted to the pots of noodles bubbling over braziers at curbside. Or to the knots of old men watching games of Chinese chess in pools of yellow light.



*H*obbled by age and custom, women whose feet were bound in childhood sit down to gossip in Yunnan Province. A traditional status symbol for rich families, foot binding escaped Marco's notice. Scholars suggest that he would have rarely seen upper-class women out in public.



Only a few old streets survive in Yangzhou, a modest city of 800,000 that shines with new buildings clad in the inevitable tile. In Marco's time it was the seat of a regional government with factories that turned out harness for Kublai Khan's army.

Marco's book claims Kublai made Marco the boss of Yangzhou, that he ruled for three years. A 19th-century expert postulated that Marco couldn't have been older than 33, pretty young for a governor. Scholars believe Marco claimed to be more important than he was—that he was perhaps a minor official, if that.

Professor Zhu Jiang, a Marco fan at Yangzhou University, disagrees. "Kublai needed administrators," he told me. "He had recently captured southern China, the Song dynasty territory. He didn't trust the Song officials, and there were not many Mongols for those jobs. So he was using 'colored eyes,' the foreigners." No Chinese record has been found that mentions Marco as an official, or that mentions him at all. "That doesn't prove anything," Professor Zhu said. "Many of the records of Kublai's dynasty were destroyed after the dynasty was overthrown."

Not Yangzhou but Hangzhou, farther south, was Marco's favorite city. Until Kublai's army captured Hangzhou in 1276, it had been the Song dynasty's opulent capital. In fact, Marco called it "Quinsai," a corruption of the Chinese word for capital—though, revealing his language handicap, he said Quinsai meant "city of Heaven." Heavenly, yes indeed. It was "the best that is in the world," and Marco, one text says, visited Hangzhou "many times." Everything he wrote there proclaimed Hangzhou's wealth and pleasures. The "great quantity of rich palaces," for example, and the fine baths where "a hundred men or a hundred women can well bathe."

To Hangzhou came ships from India, Persia, Java, and elsewhere, bringing spices, pearls, and jewels. "Foreigners stayed in this district, which is still known by some people as the foreigners' dock," said a longtime newspaperman, Wu Pengting. We were walking in a neighborhood of narrow lanes with laundry strung overhead, reaching across from balcony to balcony.

Hangzhou is rapidly throwing up a dragon's teeth skyline of shining office and apartment buildings, so the days of this district are numbered. I felt fortunate to see, with Wu's guidance, a small stream that may soon be erased. "It comes from the Grand Canal," Wu said. "Marco probably took a boat on that stream from the canal to here." Jewelry Lane

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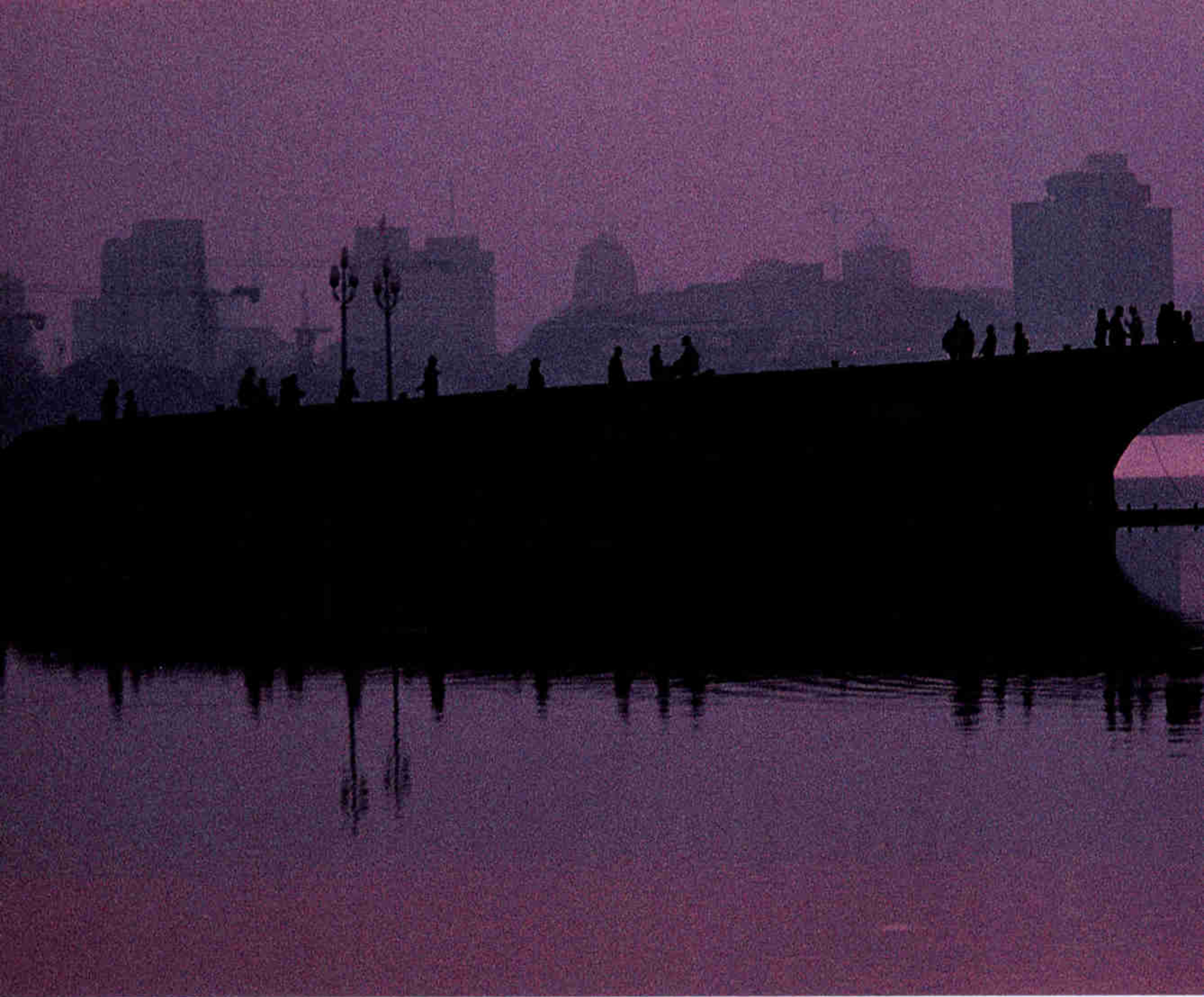
Find notes from the field and more of Mike Yamashita's photographs evoking Marco Polo's China at nationalgeographic.com/ngm/0106.



Logjam of barges builds up at a lock entering the Grand Canal near Yangzhou, a port serving the east coast of China, the busiest and richest region visited by Marco. He wrote



that he observed 15,000 vessels a day sailing on the nearby Yangtze River. Polo also reported that he himself governed Yangzhou for three years, a boast doubted by most scholars.



parallels the stream, but its merchants today are sellers of bicycle parts and an elderly cobbler sitting amid piles of soles and taps.

IN THE LATE 1280s, after some 15 years in China, the Polos could see trouble ahead. Their patron Kublai, in his 70s, was sliding into a gouty, alcoholic torpor. And Chinese resentment of the Mongol regime was growing. The Polos, meanwhile, had become “very rich in jewels of great value and in gold,” says a version of Marco’s text, presumably referring to profits from trade. It was time to go home.

Alas, Marco wrote, Kublai was so fond of his Europeans that he wouldn’t let them go, even though they “ask leave . . . several times and pray him for it very sweetly.” The Polos’ fortunes changed after three emissaries arrived from Persia. The delegation came to procure a Mongol princess to be the wife of their ruler, Kublai’s great-nephew Arghun. Kublai obliged with a girl of 17, named Kokejin. But the envoys could not escort her to Persia by land, some Polo texts say, for fighting had erupted in Mongol fiefdoms along the way.

Marco, meanwhile, had just returned from a voyage to “Indie,” meaning either India or the East Indies. Meeting him, the envoys concluded that his maritime knowledge was what they needed. They told Kublai that a sea voyage would be quicker and safer for the princess than travel by land and that they wanted the Polos to shepherd them. Kublai reluctantly acceded.

Oasis of calm, West Lake in Hangzhou entranced Marco Polo, but despite his ardor for such cities, he became restless for Venice. After several requests to leave China, the Polos won permission to escort a Mongol princess to Persia and set sail on a perilous journey home.

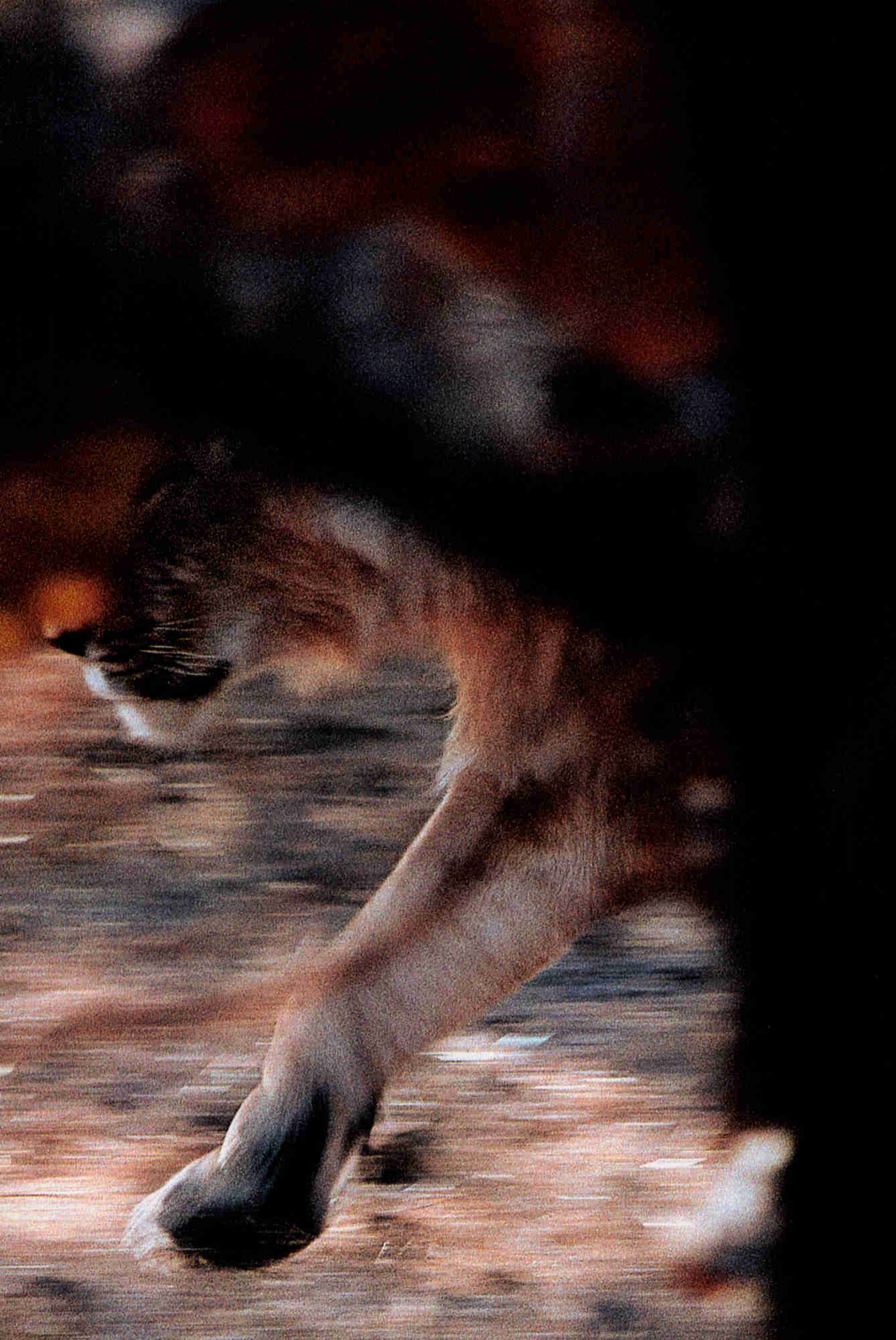


Parts of that story were corroborated as recently as 1940 by the discovery in Chinese records of a document from 1290. It pertained to rations for persons going on a voyage with Arghun's emissaries, identified as Uludai, Abisqa, and Koje. The same names are in Marco's account. While the document does not mention the Polos, some scholars accept it as proof of Marco's presence in China. Otherwise, how could he have known the obscure tale of Arghun's envoys and Princess Kokejin?

Finally Kublai had 14 ships outfitted for the voyage. Six hundred persons crowded aboard, Marco said, plus sailors. Many were going abroad to buy exotic goods. The flotilla made up in the southern port of Quanzhou, which Marco called Zaiton. It was a glamorously cosmopolitan city, with Hindu temples, Christian churches, and mosques, for here, as to Hangzhou, came "all the ships from Indie" and other regions with their treasures.

It is hard now at Quanzhou to imagine the tumult of 14 ships preparing to sail. The waterfront long ago silted up and the city's great trading era is done.

Marco seemed to feel good about himself as he departed China. I haven't told you about all of it, he wrote, but I have told you well about parts, and about the people and the gold and jewels. That's not the end of the story, he added. "All the doings of the Indians . . . many wonderful things" were still to come. And not only India lay ahead on his voyage home but also Sumatra and Sri Lanka. The homeward journey was going to be ghastly. □



ASIA'S LAST LIONS

THEY ONCE RULED THE WILD
FROM THE MEDITERRANEAN TO
INDIA. TODAY ONLY 300 REMAIN.

PEACE IN THE MOMENT

With the lioness just a leap or two away, photographer Mattias Klum was a bit uneasy until the cat casually rolled on her back. She feels safe in India's Gir Forest, but there's an invisible threat: Disease or natural disaster could quickly take the small, isolated group of Asiatic lions to the brink of extinction.







Most people think of lions as strictly African beasts, but only because they've been killed off almost everywhere else. Ten thousand years ago lions spanned vast sections of the globe, and so did people, who—as they multiplied and organized—put pressure on competitors at the top of the food chain. Now lions hold only a small fraction of their former habitat, and Asiatic lions, a subspecies that split from African lions perhaps 100,000 years ago, hang on to an almost impossibly small slice of their former domain.

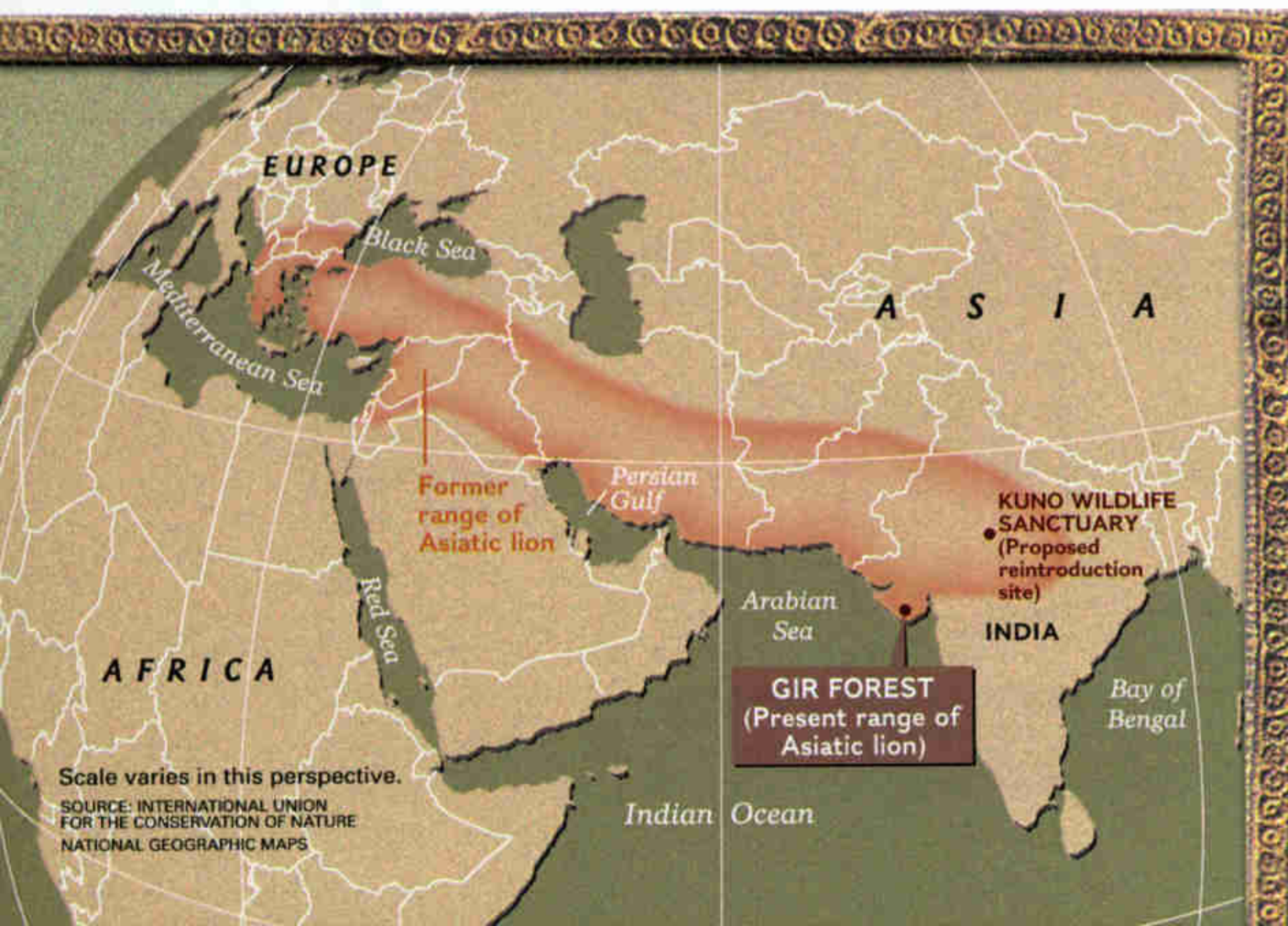
India is the proud steward of these 300 or so lions, which live primarily in a 560-square-mile sanctuary. It took me a year and a half to get a permit to explore the entire Gir Forest—and no time at all to see why these lions became symbols of royalty and greatness. A tiger will slink through the forest unseen, but a lion stands its ground, curious and unafraid—lionhearted. Though they told me in subtle ways when I got too close, Gir's lions allowed me unique glimpses into their lives during my three months in the forest. It's odd to think that they are threatened by extinction; Gir has as many lions as it can hold—too many, in fact. With territory in short supply, lions prowl the periphery of the forest and even leave it altogether, often clashing with people. That's one reason India is creating a second sanctuary. There are other pressing reasons: outbreaks of disease or natural disasters. In 1994 canine distemper killed more than a third of Africa's Serengeti lions—a thousand animals—a fate that could easily befall Gir's cats. These lions, saved by a prince at the turn of the 20th century, are especially vulnerable to disease because they descend from as few as a dozen individuals. "If you do a DNA fingerprint, Asiatic lions actually look like identical twins," says Stephen O'Brien, a geneticist who has studied them. Yet the perils are hidden, and you wouldn't suspect them by watching these lords of the forest. The lions exude vitality, and no small measure of charm.

A mother and cub safely ensconced in the forest have no idea of the tenuousness of their birthright. Greece saw its last lion shortly after the birth of Christ—about five centuries after it minted this coin (left). The Asiatic lion's range shrank steadily until the 19th century, when guns all but wiped out the population.

ROYAL COIN CABINET, STOCKHOLM, SWEDEN (LEFT)

MORE ON OUR WEBSITE

How close is too close when lions are mating? Mattias Klum answers this and other questions in a video interview at nationalgeographic.com/ngm/0106.



Scale varies in this perspective.
SOURCE: INTERNATIONAL UNION FOR THE CONSERVATION OF NATURE
NATIONAL GEOGRAPHIC MAPS





LIVING WITH LIONS

Traumatized by a lion attack that has killed one of his buffalo and wounded another, a Maldhari boy adds his chapter to the intertwined history shared by Gir's lions and its people. More than 2,000 Maldharis live within the sanctuary, and their livestock make up a third of the lions' diet. After severe droughts even attacks on

people become common as lions enter villages to find food. Even so, the Maldharis exalt the lion in lore and song, and a cat dashing through a clearing is as likely to evoke joy as fear. The state government of Gujarat has persuaded hundreds of families to leave the sanctuary, but those who remain are reluctant to relocate.



MONIKA KLUM





TABLE FOR FEW

Though the gentle intimacy of play (below) vanishes when it's time to eat, meals in Gir are not necessarily frenzied affairs. For a mother and cub sharing a deer, or a young male relishing an antelope, there's no need to fight for a cut of the kill. Prey animals are generally smaller in Gir than they are in Africa, and hunting groups tend to be smaller as well. The lions themselves aren't as big as African lions, and they have shorter manes and a long fold of skin on their undersides that many lions in Africa don't have.









THIRST FOR WATER AND LAND

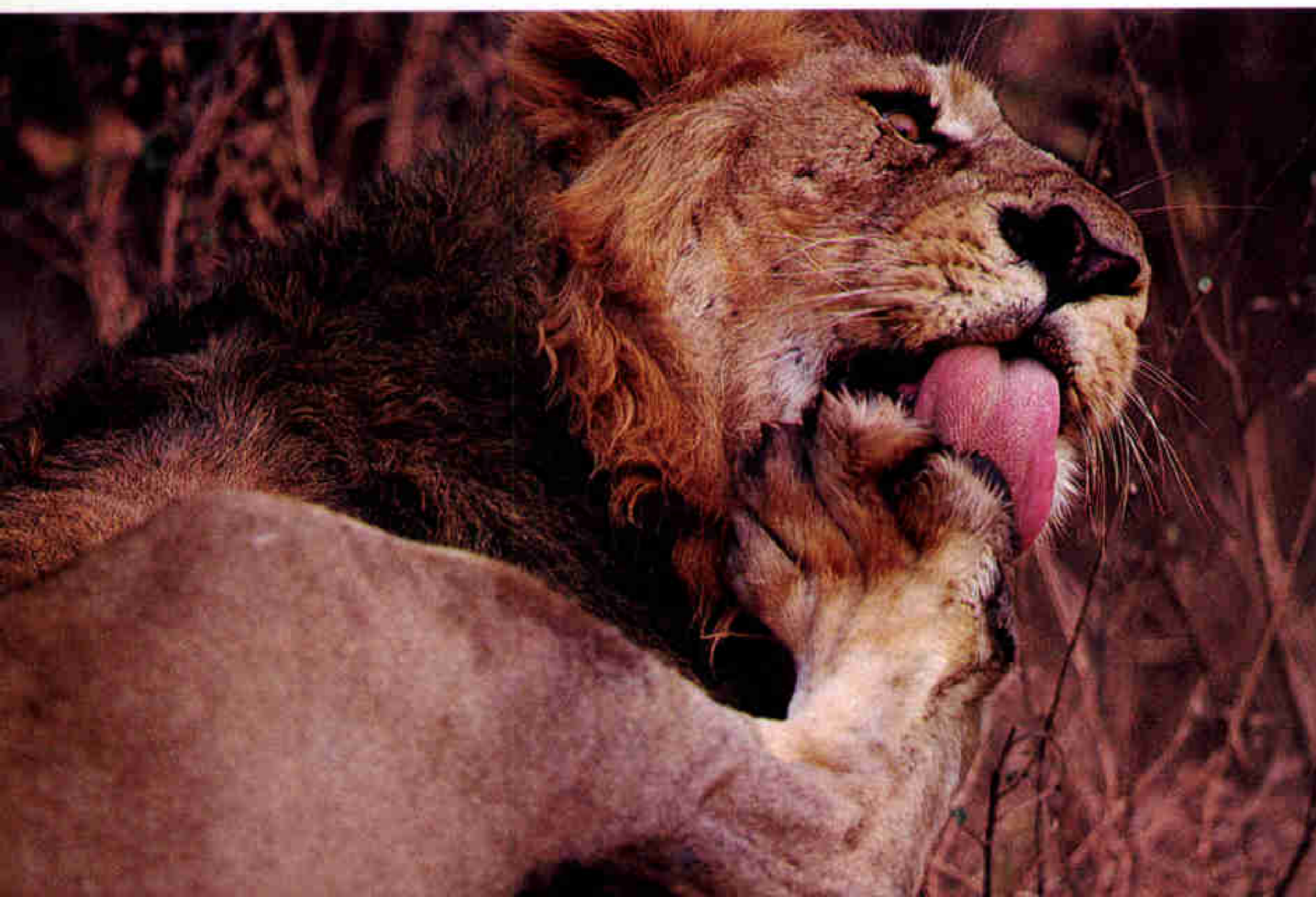
Belly full of meat, a lioness laps from a precious creek in a dry teak forest. When it comes time to count Gir's lions every five years or so, water holes and livestock are the main bait. A recent census found that 40 lions had wandered off the overcrowded sanctuary—a problem since

farms and factories surround the park. There are plans to move some of Gir's lions to the Kuno Wildlife Sanctuary more than 500 miles away, but finding other suitable homes might be difficult. In populous India protected areas with enough land and prey for large cats are rare.



DRIVE TO SURVIVE

Perpetuating the species is no easy work—lions copulate about 500 times for every litter produced. Once a female entices a male to mate, it's over quickly, and the female may discourage dawdling by growling and clawing at her mate. The process repeats after a brief interlude. Because of the Asiatic lions' small gene pool, 70 to 80 percent of sperm is deformed—a precarious ratio that can lead to infertility when lions are further inbred in zoos. Adhering to a strict breeding program, European zoos have boosted their Asiatic lion count to almost 60.







THEIR DAY IN THE SUN

Life has no worries for the moment, but the tender play of mother and cub could vanish from Gir as quickly as the warm glow of late afternoon. In ancient India one of the greatest tests of leadership was to fight a lion. In modern India, where the Asiatic lion has become a national symbol, it may be to save one. □

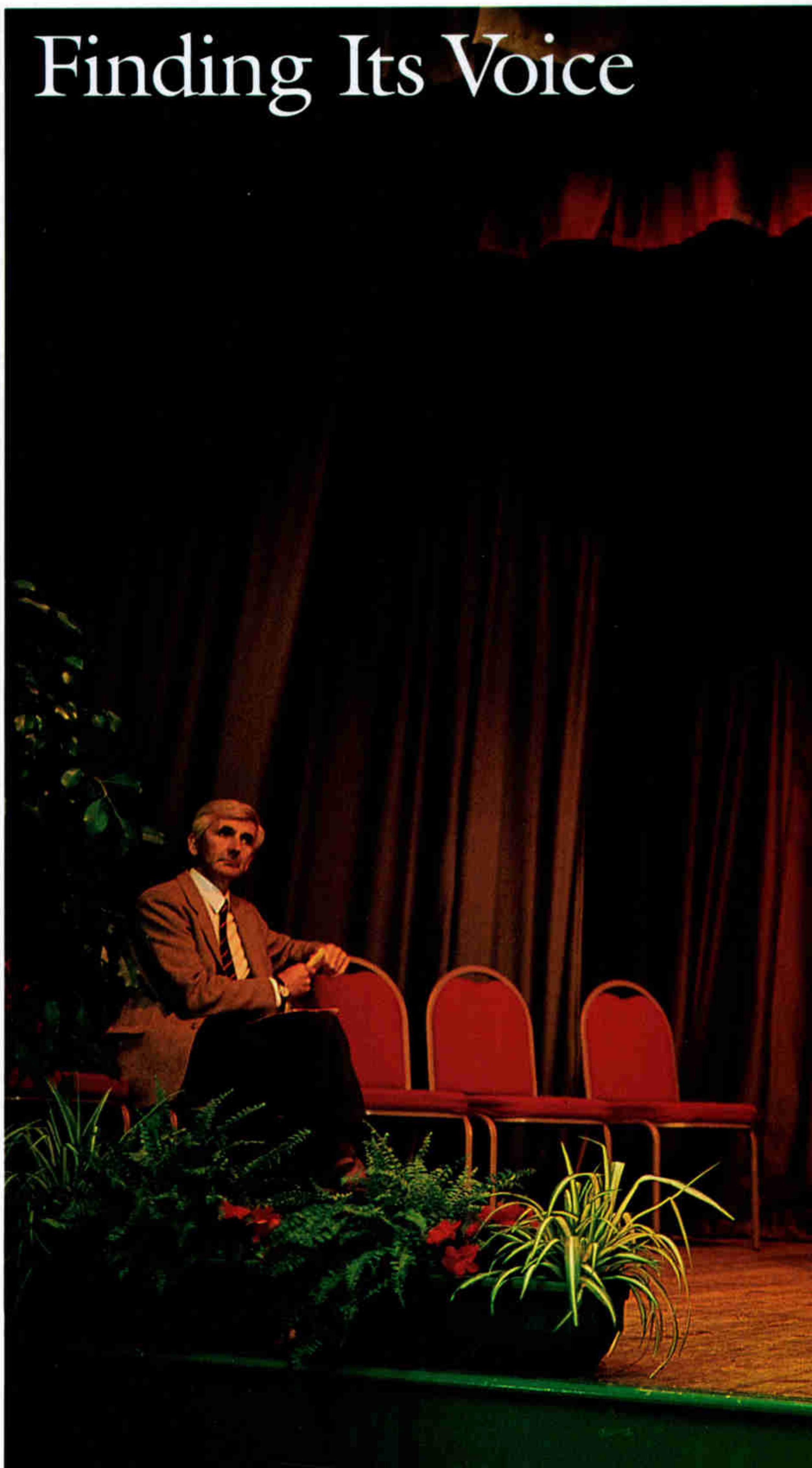


Wales

With its valleys

Finding Its Voice

Performing a song in her native tongue, eight-year-old Glesni Euros competes for a prize at an eisteddfod, a traditional cultural festival, in Llanwrtyd Wells. One of Europe's oldest living languages, Welsh is now gaining in popularity after decades of decline. "It's my first language, and I'm very proud of that," says Glesni. "I'll do whatever it takes to keep it alive."



greener and its spirits higher, Wales steps out of England's shadow.



Ribbons bedeck a pen of champion sheep at a show in Rhandirmwyn. Such events still hold a key role in Welsh culture as the country diversifies its economy and discovers a new sense of pride.





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“Simon, do you want to try the first one?” asked our teacher, Carole Bradley, on the first morning of a three-day crash course in the Welsh language at Cardiff University. Carole, a shy woman with frizzy blond hair, couldn’t have been nicer.

But as I stared at the words *Betws y Coed*,

I began to get that sweaty feeling I remember from school when Mr. Crawshaw, the choleric chemistry teacher, would quiz us about the periodic table.

“Bet-woos-ee-co-ed,” I stammered.

“Betus-uh-COYD,” corrected Carole, rhyming the first word with lettuce.

Her students, nine of us in all, were a heterogeneous bunch. Andrew, whose shoulder-length hair made him look like a character from *Wayne’s World*, was here because his Welsh-speaking girlfriend wanted to talk to him in her native tongue. Bleddyn, an intern at Friends of the Earth, wanted to improve his job prospects.

“Beware of false bedfellows,” warned Carole, “Welsh words that look like familiar English words but are pronounced completely differently.” Take the word *gallu*, for instance. I had assumed that it would be pronounced something like those famous winemaking brothers in California. I was wrong.

“Gackley!” squawked Carole, making a noise like the gears crashing in my old Volvo. Welsh is a guttural language, and for us it meant doing things with our uvulas we had never done before. “You need to drink lots of coffee,” Carole added encouragingly, “to get the spit going in your mouth.”

For three days we hacked through the dense undergrowth of this arcane language, growling like Tigger, crunching consonants as though chewing on gravel. It was fun saying *gwin gwyn*, Welsh for white wine, or *sgod a sglod*, a colloquialism for fish and chips. My favorite was the wonderfully onomatopoeic word for

the game of squash, *sboncen*, from the verb “to bounce.” By day two we could ask, “*Dych chi’n gallu chwarae rygbi?*” “Can you play rugby?” By day three we were ready for the ultimate tongue twister, the name of a village in north Wales: Llanfairpwllgwyngyllgogerychwyrndrobwllllantysiliogogoch.

The language has always been the ultimate marker of Welsh identity, but a generation ago it looked as if Welsh would go the way of Manx, once widely spoken on the Isle of Man but now extinct. Government financing and central planning, however, have helped reverse the decline of Welsh. Road signs and official public documents are written in both Welsh and English, and schoolchildren are required to learn both languages. Welsh is now one of the most successful of Europe’s regional languages, spoken by more than a half million of the country’s three million people.

The revival of the language, particularly among young people, is part of a resurgence of national identity sweeping through this small, proud nation. Last month Wales marked the second anniversary of the opening of the National Assembly, the first parliament to be convened here since 1404. The idea behind devolution was to restore the balance within the union of nations making up the United Kingdom. With most of the people and wealth, England has always had bragging rights. The partial transfer of legislative powers from Westminster, implemented by Tony Blair, was designed to give the other members of the club—Scotland, Northern Ireland, and Wales—a bigger say and to counter centrifugal forces that seemed to threaten the very idea of the union.

The Welsh showed little enthusiasm for devolution. Whereas the Scots voted overwhelmingly for a parliament, the vote for a Welsh assembly scraped through by less than one percent on a turnout of less than 25 percent. Its powers were proportionately limited. The Assembly can decide how money from Westminster or the European Union is spent. It cannot, unlike its counterpart in Edinburgh, enact laws. But now that it is here, the Welsh are growing to like their Assembly. Many

people would like it to have more powers. Its importance as a figurehead will grow with the opening, in 2003, of a new debating chamber designed by Lord Richard Rogers, one of many new buildings that are transforming Cardiff from a decaying seaport into a Baltimore-style waterfront city. Meanwhile a grant of nearly two billion dollars from the European Union will tackle poverty. Wales is one of the poorest regions in Western Europe—only Spain, Portugal, Greece, and the former East Germany have a lower standard of living.

Newspapers and magazines are filled with stories about great Welsh men and women,

boosting self-esteem. To familiar faces such as Dylan Thomas and Richard Burton have been added new icons such as Catherine Zeta-Jones, the movie star, and Bryn Terfel, the opera singer. Indigenous foods like salt marsh lamb are in vogue. And Wales now boasts a national airline, Awyr Cymru (pronounced a-wir CUM-ree). *Cymru*, which means “land of compatriots,” is the Welsh name for Wales. The red dragon, the nation’s symbol since the time of King Arthur, is everywhere—on T-shirts and bumper stickers, rugby jerseys and even cell phone covers.

“Until very recent times most Welsh people had this feeling of being second-class citizens,”

Next Door and a World Away

Bordering England for more than 150 miles, Wales shares a long history with its neighbor. Rome conquered both countries. Wales subsequently repelled Anglo-Saxon invaders but fell under English rule after its defeat by King Edward I in 1277-1284.

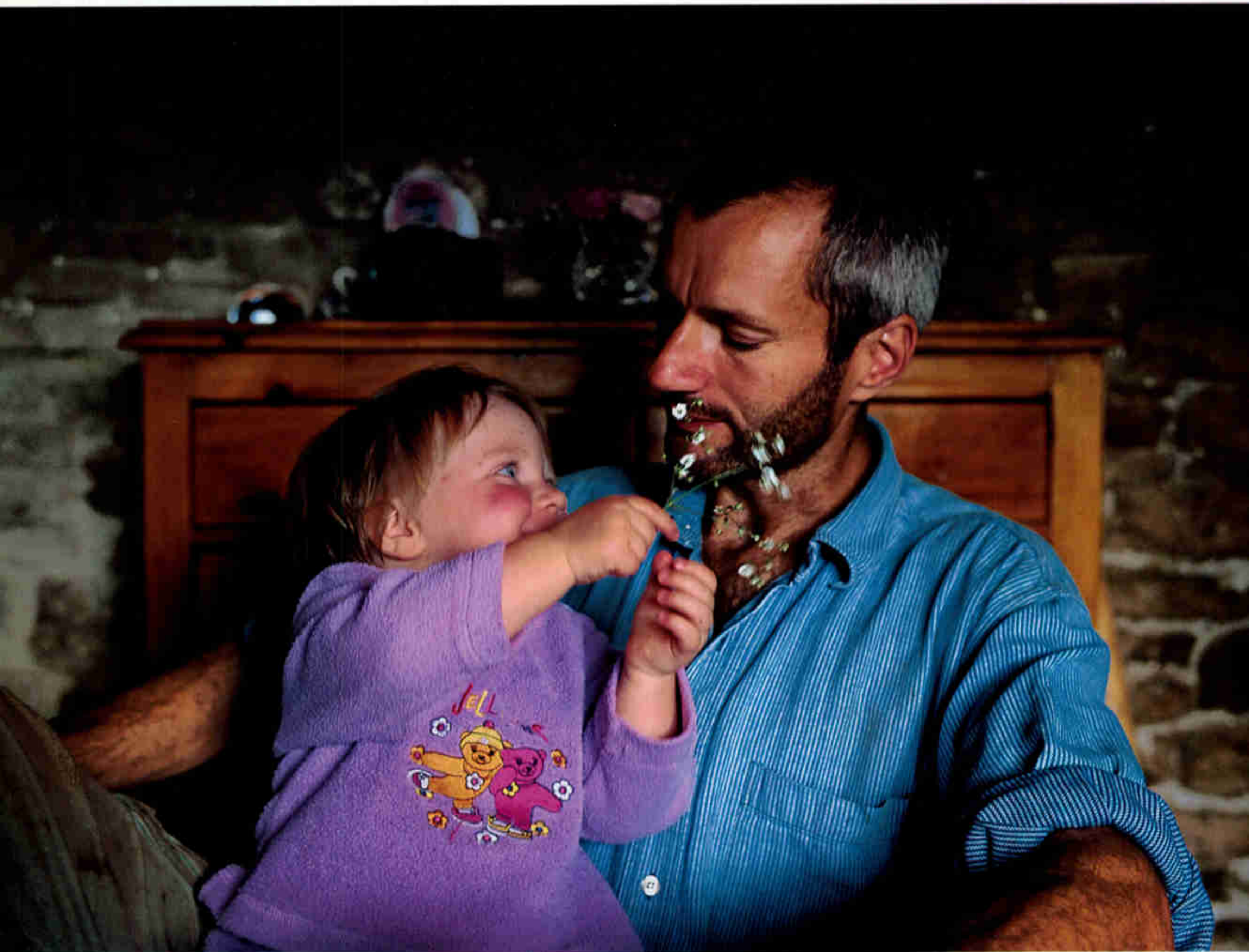
Today the north and south of Wales are better connected to England by road than they are to each other. Yet the whole country, called *Cymru* in Welsh, still embraces the unique culture that has united it for centuries.



- ⚔ Abbey or church
- 🏰 Castle
- ⛪ Cathedral
- 🏛 Prehistoric ruin
- 🏰 Roman ruin

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RELIEF BY JOHN A. BONNER
NATIONAL GEOGRAPHIC MAPS



said Dyfan Jones, an 18-year-old student with cropped, bleached hair, Lennon glasses, and a red fleece jacket. It was a warm summer night, and I was sitting on the grass with a group of young people in Llanelli, an industrial town in the south, outside the rock music venue of the National Eisteddfod, Wales's annual cultural festival. The disused factory in front of us echoed to the sounds of new Welsh bands hoping to follow the trail blazed by the Manic Street Preachers, Catatonia, and Gorky's Zygotic Myncci.

"There was almost a genetic predisposition for lack of confidence," Dyfan continued. Equally comfortable in his Welshness as in his membership in the English-speaking, global youth culture and the new federal Europe, Dyfan, like the rest of his generation, is growing

up with a sense of possibility unimaginable ten years ago. "We used to think: We can't do anything, we're only Welsh. Now I think that's changing."

One of my most vivid childhood memories is of a family holiday in Tenby, on the Pembrokeshire coast. Day after day through one wet July we stared through the rain-smudged windshield of our 1956 Hillman, eating damp sandwiches as the rain drummed on the roof. Abysmal weather (Snowdonia National Park has an average rainfall of 118 inches a year) may be one reason for the gloomy and depressive cast of mind that has afflicted the Welsh. They are the original Britons, predating even the Celtic tribes that later inhabited the whole of the British Isles, but since the 16th century Wales has been joined at the hip to England. Its



“My work is where my family is, so I can see my daughters every day,” says Bruce Davies, a farmer near Monmouth. Jasmine, going on two, captivates him during a coffee break. Georgie, almost six, accompanies him on a round of chores. On 200 acres owned by their mother and other acreage they rent, he and his brother raise cattle and sheep and grow fodder for the animals. Financially they are just getting by. “You have to love this work to keep doing it,” Davies says. Other farmers are selling their land—often to retirees and vacationers—a shift that may radically alter the familiar landscape of pastures and hedgerows greened by rain.







In the early 1900s the Valleys had 620 deep coal mines. *Closed a generation ago like many, the mine in Blaenavon has been reborn as a museum where some 75,000 visitors a year don headlamps and descend into the tunnels. Known as Big Pit, the mine once fueled the town's ironworks, which helped forge the industrial revolution. In recognition of that pivotal time UNESCO last year named Blaenavon a World Heritage site.*



language was suppressed, its culture assimilated. “Wales—See England” was how the *Encyclopaedia Britannica* listed it in the late 1800s. The fact that it was an English king of Welsh descent, Henry Tudor, aka Henry VII, who founded the Tudor dynasty, and his son, Henry VIII, who passed the Act of Union linking the two countries—a marriage that the majority of Welsh people still favor—only makes the situation more complex.

“Some people say we want to leave the United Kingdom,” said Lord Dafydd Elis-Thomas, the presiding officer of the National Assembly, as we sat in his spacious office overlooking the new Cardiff Bay development area. A bright, charismatic man with a Gorbachev-like birthmark on his cheek, Elis-Thomas is one of Wales’s highest profile politicians. “But

it would be hard for us to leave the U.K. We set it up! I think what we are ultimately looking for is a form of government within the United Kingdom but as part of a federation of European regions. But it is up to the people of Wales where they want to take it.”

As to the larger question of Welsh identity, the answers you get depend on where you are and who you ask. “When I’m in England, everyone thinks I’m Welsh, but when I’m in Wales, they all think I’m English,” said Bruce Davies, a young farmer from near Monmouth. “We’re like the Kurds, really,” he added, with heavy irony. “Nobody loves us.” We were sitting around the kitchen table with his family in his slate-roofed farmhouse a few miles from the English border. With his



New entrepreneurs are pulling the economy out of the slump brought about by the decline of heavy industry. A group of miners pooled their severance pay and bought Tower Colliery (left) after the British government closed it in 1994. Now the country's only deep-pit coal mine, it operates at a profit. "We're going to rebuild Wales," says Glyndŵr Roberts, one of the new owners, "and Tower is going to be there in the middle of it." Foreign-owned high-tech companies such as LG Electronics (above) are contributing to the recovery. Wales's first five-star hotel, the St. David's, opened in 1999 as part of the redevelopment of Cardiff, the capital (below). Cardiff Bay, once the world's busiest coal port, became a lake with the recent completion of a dam at its mouth.



The boys of Barry spend summer days seaside, where rocks become a diving platform at high tide. Nearby docks were built in the late 1800s in hopes of making the town a coal center rivaling Cardiff.





battered camouflage jacket, blue jeans, and mud-spattered leather work boots, Bruce would have fit in on the American frontier—his prize possession is a collection of antique John Deere tractors.

Three generations were gathered in the kitchen: Bruce's mother, Betty; his elder brother Russell; and his two children, Georgie, 5, and Jasmine, not yet 2. Bruce's wife, Caroline, moved around the table, serving lamb with potatoes, beans, and carrots. In the corner stood an old wooden bench, hacked and grooved with knife cuts, that had once been used to slaughter pigs. Jack, the family terrier, rushed about barking.

"The border has never been rigid," said Betty. "A Welshman who did well on the hills would look over the border for better land and move down. Over the border is just the next county, really. Round here there's more difference between town people and country people than between the Welsh and English."

Monmouth is heavily anglicized. Henry V of Agincourt fame was born here. So was Charles Rolls of Rolls-Royce. Bruce's family reflects the fluid affiliations of the Borders, as this area is known. He farms in Wales but sells his livestock in England. His mother is from Herefordshire, his father of Welsh descent. His wife is English. Even the kind of agriculture he practices on his 350-acre farm is a hybrid.

"We run about 300 ewes, which produce about 450 lambs," explained Bruce. "We also have a few cattle. And we grow crops like barley, oats, and potatoes." Despite working more than 80 hours a week, he can barely make ends meet. The weakness of the euro against the pound, mad cow disease, and, most recently, foot-and-mouth, combined with aggressive price-cutting by supermarkets, have driven livestock prices to record lows. In the past five years the average income of farmers has slumped by 90 percent to 4,500 pounds (\$6,500) a year. "My father had 200 ewes on this land and 10 cows," said Bruce, with emotion. "And he still managed to save 1,000 pounds a year to pay off the mortgage. Today I couldn't even buy the ground."

The region's proximity to the populous cities of England is creating new pressures. "There are lots of downshifters here these days," said Caroline. "English people buying up farmhouses to live the good life."

It was a complaint I heard everywhere. Wild, beautiful, and cheap, Wales is a magnet for second-home owners. And the farther west I went into the Welsh-speaking areas, where the small family farm is regarded as the bedrock of social values and custodian of the language, the more resentful the tone. One person I spoke with said he wanted laws banning English people from buying land at all. But how do you ban market forces when the richest city in Europe, London, is only 120 miles away?

The influence of England on the Borders region is one instance of the way geography has always shaped Wales's identity. Though smaller than Massachusetts, Wales has a great diversity of landscapes and regional cultures. The south and east, where coal mining brought massive immigration and where three-fourths of the population still lives, are largely industrial (or post-industrial, more accurately), urban, English-speaking, multiracial, socialist in political tendencies, cosmopolitan in outlook. The north and west are mainly rural, Welsh-speaking, conservative, and inward-looking. Between them lies the "sheep curtain," the rugged central massif where few people but most of the country's 11 million sheep live.

The mountainous terrain further reinforces regional differences. North Wales is still hard to reach by road from the south. Goods (and ideas) have always flowed along an east-west axis, linking Wales to London and the world beyond. The vote for a Welsh National Assembly exposed these fault lines. West Wales tended to vote "Yes." Along the border with England in the east, where turnout was much lower, the vote was largely "No."

For Greg Jones, a successful orthopedic surgeon in Newport, a steel town in southeast Wales, pride in his Welsh heritage does not preclude a deep attachment to the idea and institutions of the United Kingdom. "I am absolutely fervent in my support for the identity, in a cultural sense, of Wales," he told me over lunch at his favorite restaurant, the Walnut Tree, near Abergavenny. "But as part of the union."

A burly man with a jocular face, blue-gray eyes, and beard, Greg grew up in a Welsh-speaking family in the Valleys, as the former coal mining region is called. He then joined the



Foul weather produces a fair sight for fishermen casting into Swansea Bay at a village called *The Mumbles*. Connected to Swansea in 1807 by the world's first regular passenger rail transport—with cars drawn by horses—*The Mumbles* became a popular resort for Victorian society.

Royal Navy, which gave him medical training and propelled him out of his parochial background. But though he voted against an assembly, he remains Welsh to the core, never more so than when Wales is playing rugby. He has worked with the national team as a medical adviser and counts among his friends such legends of the game as J. P. R. Williams and Gareth Edwards. “When England are playing Wales, there is no question where my loyalties lie,” he said, splashing Chardonnay into his glass. “But if the British Lions are playing the New Zealand All Blacks, I’m the first to support the English guys in the British team. Culturally, my wife and I feel Welsh. In terms of nationality, we’re British. And at the end of the day, I think that’s how most people in Wales feel.”

Tell that to Heulwen (pronounced HAIL-wen, it means “sunshine”) Hughes Aeron, a teacher from the heartland of Welsh nationalism, the county of Gwynedd, in the northwest. “Our people are being anglicized,” she said truculently, as we stood in the ruins of Strata Florida—or Ystrad Fflur, as it is known in Welsh—a Cistercian abbey in central Wales. “There are so many people moving in. And they don’t want to know about our history or our language.”

Set in a fertile valley surrounded by rolling

hills, Strata Florida is one of Wales’s most resonant historic sites. Dafydd ap Gwilym, a contemporary of Chaucer’s and the best loved of Wales’s many bards, is believed to lie buried under a yew tree in the graveyard. “Welsh-speaking people have lived in this area for so long most families can trace themselves back to the Welsh princes,” said Heulwen wistfully.

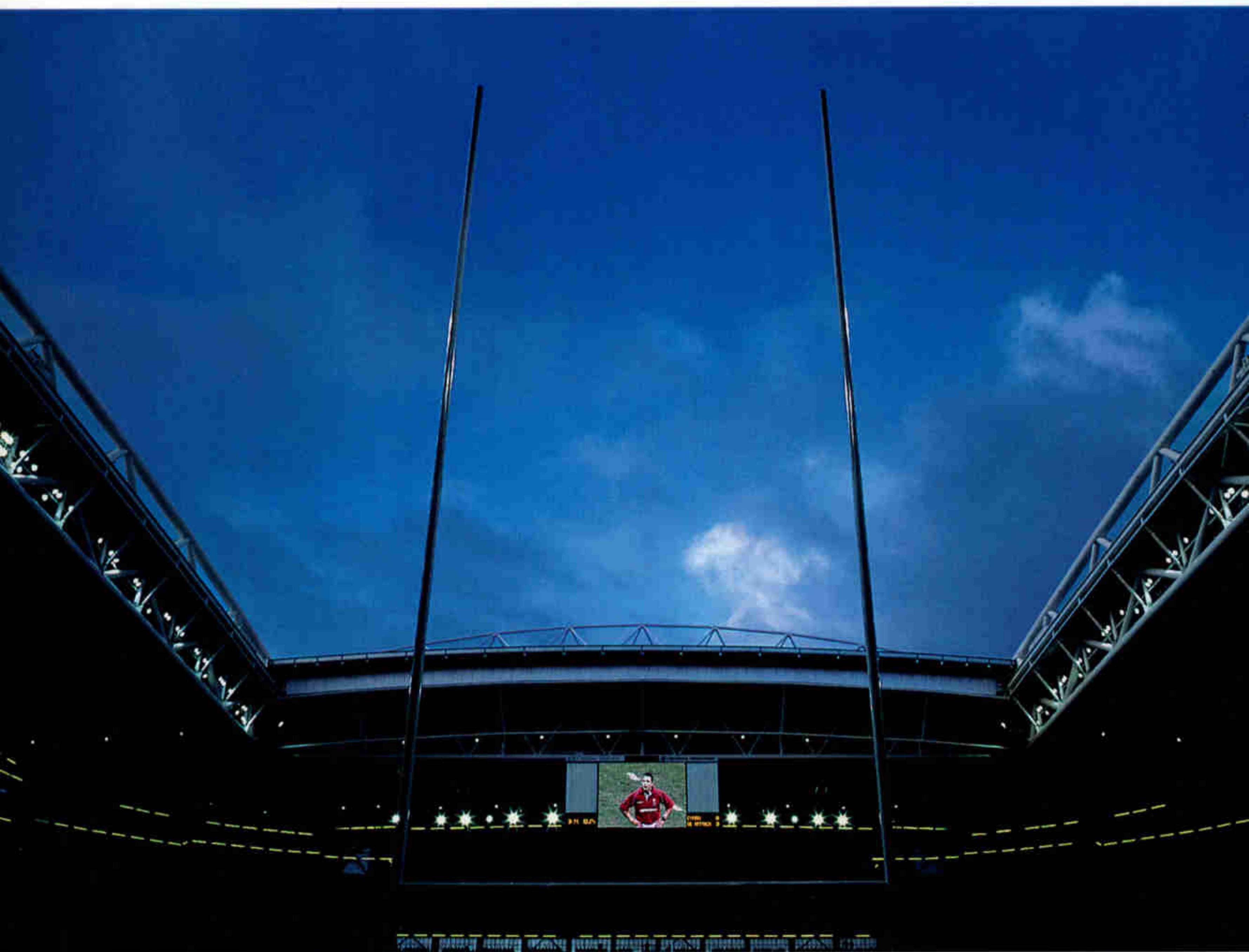
With her flowing blue dress, green eyes, and the cluster of Celtic-style rings on her fingers, Heulwen could have stepped out of the court of one of those princes. But like many people from north Wales, she has an embattled sense of identity, forged by centuries-long opposition to England. “We’re the last remnants of the Celts,” she said defiantly. “We have lost most of our traditions and mythology. But we’re still here! Clinging to the rocks!”

She was referring to folksinger Dafydd Iwan’s patriotic anthem, “Yma o Hyd” (“We’re Still Here”). Only in Wales could a protest song begin with an evocation of someone living in A.D. 383. But history has always weighed heavily on the Welsh soul. It has sustained Welsh identity. It has also been a quagmire into which generations of Welsh men and women have stepped, to be suffocated by a yearning for a remote and sentimentalized past. “Like the Greeks,” wrote Alun Richards, the Welsh novelist, in 1986, “the Welsh enjoy their woes and





History has always weighed heavily on the Welsh soul. *In the midst of a storm sunlight floods Machynlleth, seat of Wales's first parliament, which national hero Owain Glyndŵr convened in 1404. Crowned Prince of Wales by his countrymen, Glyndŵr led an unsuccessful revolt against the English crown. Not until the inauguration of the Welsh National Assembly in Cardiff in 1999 did Wales finally regain a measure of self-rule.*



they nourish them in abundance, often preferring remembering to living.”

The eminent geneticist Steve Jones suggests that even at a genetic level the Welsh have stubbornly clung to a distinctive identity. “We have been doing some work on one particular set of genes,” he said, as we clambered to the top of Pen Dinas, an Iron Age hill fort overlooking the seaside town of Aberystwyth. An elfin man with darting brown eyes, Jones was born here but now divides his time between France and London, where he is professor of genetics at University College. “We drew a line from East Anglia across England then across the border into north Wales to Anglesey. Then we collected saliva samples from schoolchildren along that line and analyzed their DNA.”

The findings surprised Jones. “There is a Y

chromosome that is quite rare in England and Europe but common in Wales—I’ve got it myself—above all in west Wales. It has been passed from father to son to grandson.” We had reached the top of the hill and stood looking across Cardigan Bay toward Ireland.

A Celtic gene? Not according to Jones. “The Celts were defined from artifacts found in northern Italy and southern Germany. The link of the Welsh Y chromosome is not with those who see themselves as real Celts but with the Basques in northern Spain.” The Welsh, like the Basques, says Jones, are the descendants of Europe’s aboriginal inhabitants, who were pushed to the mountainous periphery of the continent some 5,000 years ago by the people that came to be known as Celts. “The Basques kept their genes and their language,



Almost a religion, rugby inspires passion like nothing else. Its cathedral, Cardiff's new Millennium Stadium (left), hosts international matches that draw crowds of more than 70,000. "You go up with a gang of mates on a bus or train, you have a few beers and watch the game," says Geraint Phillips, a steelworker from Llanelli. "It's a great day out." Fans can also get their fix at smaller venues around the country. On their home pitch (above) the Llanelli Scarlets play a benefit match against retired stars. Before a pre-season match against a team from the English city of Bath (Caerfaddon, in Welsh) Llanelli ball boys and scorekeepers hang out at the scoreboard.



which is nothing like Welsh,” he continued, as a gust of wind sent us scurrying for cover behind a stone obelisk. “The Welsh, by contrast, kept their genes but forgot their language. Much later, they picked up a Celtic language and a Celtic identity. But biologically they are a much older people. They have probably been here since the last ice age.”

As well as a chromosome, the Welsh have handed down over the generations a deep attachment to the 8,000 square miles they inhabit. “*Hiraeth*,” which can be loosely translated as a longing for home, is one of the core words in the Welsh language. Even today many people live and die within 30 miles of the valley in which they were born. In a rootless, mobile world this anchor to a particular place and community is a source of certainty. As an English woman said, when I asked her what was essentially different about her Welsh husband: He knows who he is. He knows where he’s from.

When Harry Jones, who lives in Snowdonia National Park, talked to me about Cadair Idris, the mountain in whose shadow he has spent most of his life, he did so as though talking about a close relative. “I think the world of Cadair,” he said, as we sat in the backyard of his cottage in Abergynolwyn. “I’ve been to the mountains in Switzerland, and they are wonderful, no doubt. But I wouldn’t swap them for Cadair. That was my mountain, wasn’t it? In a way it brought me up. It taught me everything I know. It was part of me.”

General Picton, who died at Waterloo and is buried at St. Paul’s Cathedral in London, once said that the ideal infantryman was a south Welshman, five feet four in height. Harry would have passed muster with flying colors. It was his 95th birthday, but he still walked head up, shoulders back, without a stick. When I arrived, he was preparing his lunch: roast pheasant with potatoes, carrots, and cauliflower from the garden. “I’m no boozier for one thing,” he said, when I asked the secret. “And I had a good wife. And a good mother.”

Not to mention the best StairMaster in the world. Every day for several years after World War II, Harry used to scramble to

the top of 2,927-foot Cadair Idris, carrying 20 pounds of provisions for the refreshment room he operated on the summit. I had found its stone remains the day before, after an arduous hike. Wales’s mountains are some of the oldest on Earth, and as I stood looking across Snowdonia, I felt, more even than in the Himalaya, as though I were on the roof of the world.

It had taken me five knee-busting hours to get there. Harry used to make it in just over an hour. “Most of the provisions were taken up by a man called Dafydd William Davies,” he recalled, as we munched on Welsh cakes, thick griddle cakes studded with currants, and drank tea. “Dafydd had a horse named Bess. Oh, they were wonderful together. When the mist was down, they couldn’t see. Dafydd wore glasses, which got all misted up. So they would stand there arguing about which way to go. I would follow behind listening. Oh, I had some fun! The horse would stand there shaking its head, while Dafydd argued with her. Finally he’d say, ‘Well, bloody well go the way you want!’ And he’d follow Bess down till they got below the mist. She always knew the way!”

Harry was the eighth person I’d met with the name Jones. Everyone seemed to be called Jones, Williams, Davies, or Evans. To prevent confusion, the Welsh use nicknames, and nowhere is their teasing wit and love of language more apparent. Most nicknames derive from a person’s occupation, like the builder I heard of called Will Five Bricks or the baker Dai Bread in Dylan Thomas’s *Under Milk Wood*. My favorites were the two Evanses from a village in Carmarthenshire. One was an undertaker, the other a travel agent. The travel agent was known as Evans There and Back, the undertaker as Evans One Way.

Humor, and tolerance, have always been part of Welsh culture. But anxieties about globalization, resentment at the hegemony of the English language, and the uncorking of old gripes are exposing the darker side of national pride. “English, go home!” has been sprayed on the streets of Cardiff. In August last year an elderly English couple in Swansea complained to the Race Equality Council of harassment, including an arson attack on their house.

Meanwhile, after centuries of feeling victimized, the Welsh-speaking minority is busily accruing power. Many of the new elite were political activists in the ’60s. Today they own

MORE ON OUR WEBSITE
See, hear, and taste more of Wales—including a recipe for Welsh cakes—at nationalgeographic.com/ngm/0106.



Hungry for handouts, *sheep flock to a snack van on a mountain pass called the Bwlch, or gap, overlooking the heart of coal country. Once black with mine debris, the land has become verdant again as Wales reclaims its past and celebrates its new identity.*

apartments in Penarth, one of Cardiff's most expensive suburbs, and holiday homes on the coast. The language is becoming a swipe card to success. The majority of jobs in the media are held by Welsh speakers.

"I am proud to be Welsh," said Tyrone O'Sullivan, chairman of Tower Colliery, as we sat in his trailer-style office. Fifty-four years old, with massive shoulders and a mane of salt-and-pepper hair, O'Sullivan became a legend in Wales when he led a workers' buyout of the colliery in 1994 after government-owned British Coal closed it down. "But this fervor for Welshness is a dangerous thing," he continued. "Most of the kids in my valley don't speak Welsh. My daughters don't speak Welsh. They've got good university degrees. They've been to Welsh colleges. They're bright. But they're having a hard time finding good jobs in Wales because they don't speak Welsh."

In the early 1900s the Valleys had 620 deep coal mines, surely the greatest concentration the world has ever seen. People flocked here from all over the world—Italians, Poles, Germans, even Americans—turning the area into a sort of Welsh Klondike. Thousands came from Ireland, among them O'Sullivan's forebears.

Tower is the last deep mine in Wales. But it is here in the Valleys, where rugby is almost a religion, that the heart of Wales still beats

the strongest. Ironically, although the Welsh-speaking minority has always laid claim to the mantle of true Welshness, it is also here in this traditionally English-speaking district that the Welsh are most different from the English. In their warmth and physicality, their passion for singing, their uncomplicated way of dealing with each other, they reminded me of Italians.

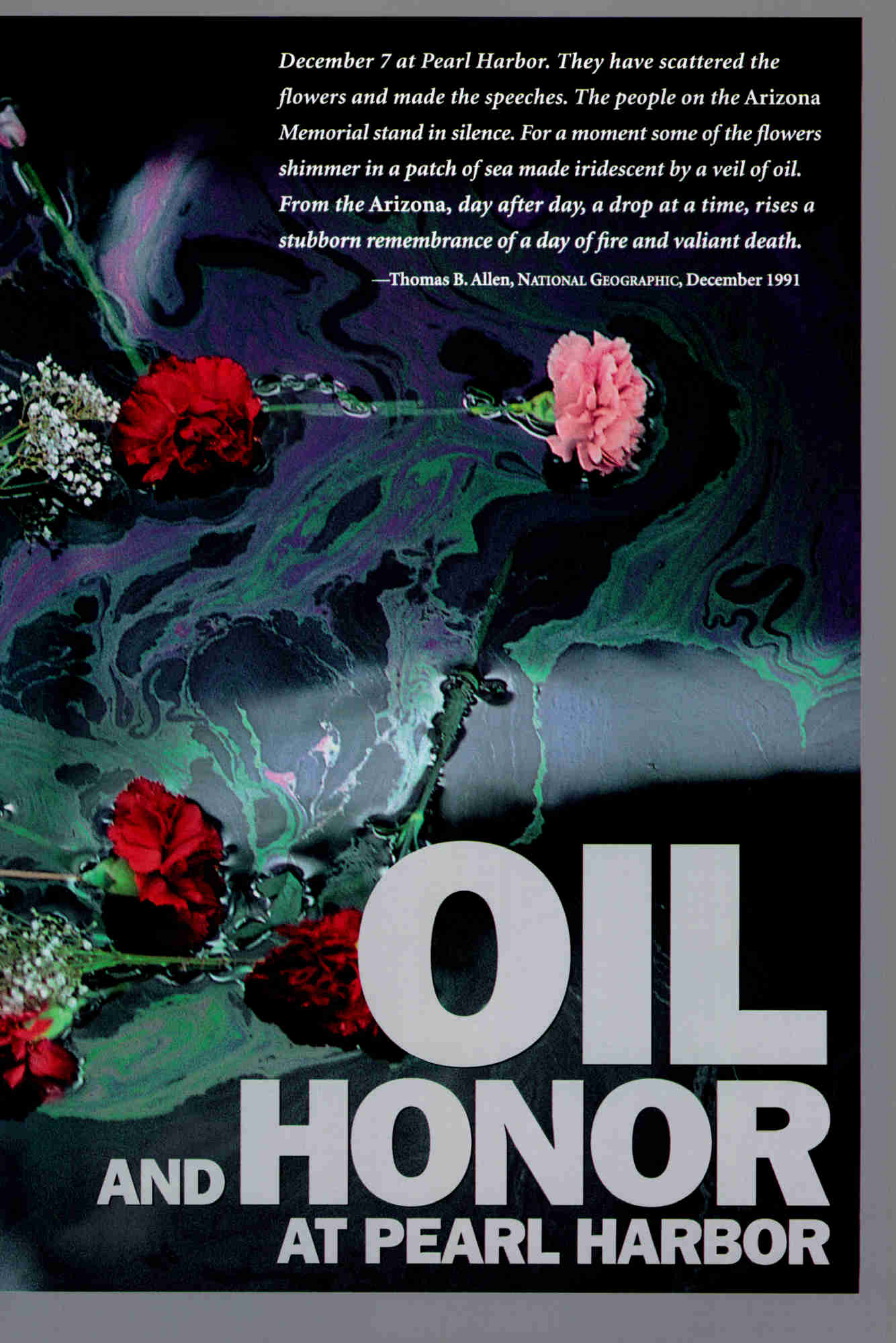
"The day the pit closed, I was down in Newport," said Tyrone, recalling the events of 1994. "So we jumped in the car. There were five of us. As we drove home, I started crying. So I pulled onto the side of the motorway and sat there sobbing. Eventually I stopped, and the others said, 'Let's go and have a pint.' So we went to a pub in Aberdare. And it was that night we decided to try and buy the pit. And we said, 'If we ever get it, we'll come back to the same pub.'"

They did. And for Tyrone O'Sullivan it was a deeply personal victory. His father had worked at Tower and had died in a roof collapse. He himself had been at the mine since the age of 15. Today, Tower Colliery produces 600,000 metric tons of anthracite a year and is in the black. Profits will soon be boosted by a movie.

"Who's going to play you?" I asked Tyrone.

"Well, it's hard to find a Welshman big enough!" he said, bursting into a peel of laughter that must have been heard four and a half miles underground at the coal face. □





December 7 at Pearl Harbor. They have scattered the flowers and made the speeches. The people on the Arizona Memorial stand in silence. For a moment some of the flowers shimmer in a patch of sea made iridescent by a veil of oil. From the Arizona, day after day, a drop at a time, rises a stubborn remembrance of a day of fire and valiant death.

—Thomas B. Allen, NATIONAL GEOGRAPHIC, December 1991

OIL

AND HONOR

AT PEARL HARBOR

O

IL STILL SEEPS from the U.S.S. *Arizona*, the sunken battleship of Pearl Harbor. Some say it's the blood of her 1,177 fallen sailors and marines; some say it's their tears. The sentimental speculate that the oil—No. 6 fuel oil—will stop flowing when the last survivor of the *Arizona* is gone.

That won't be long now. As the 60th anniversary of the Japanese attack approaches, many of the *Arizona*'s remaining survivors plan their final pilgrimage to Hawaii. Here the aged veterans will again recall with enduring wonder how a tropical Saturday night, sweet with ukuleles and plumeria blossoms, slipped by to a Sunday morning of convulsive horror. And how that changed their lives forever.

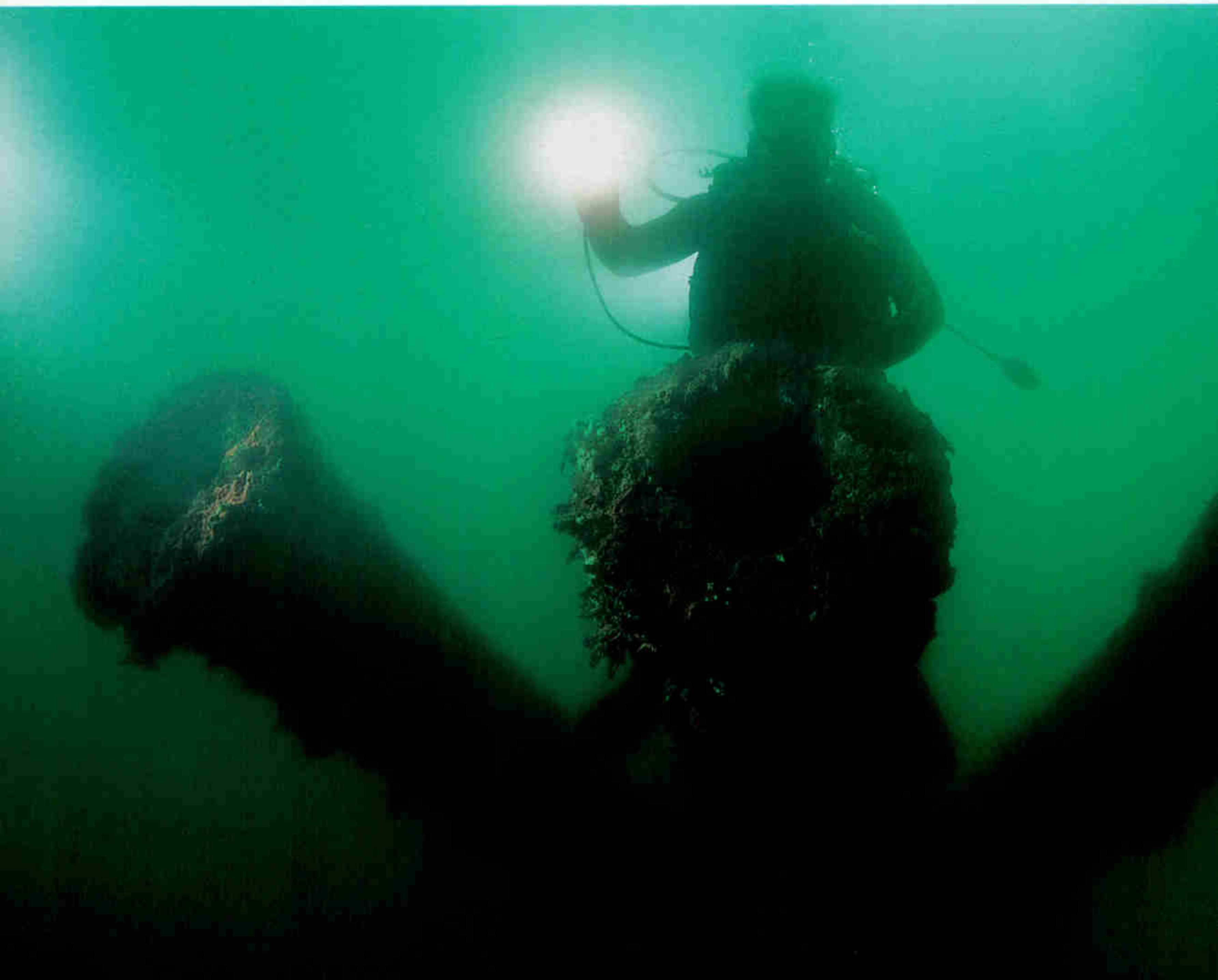
The *Arizona* was one of eight American battleships attacked and damaged by Japanese planes on December 7, 1941, in the first act of World War II against the U.S. in the Pacific. Six survived to fight again, but the *Arizona* still

rests in the fine gray silt of Pearl Harbor, in 40 feet of water. She lies stripped to the main deck, her proud superstructure of towers and masts long gone. The rim of her number three gun turret and other rusty fixtures penetrate the surface, and a graceful white monument bestrides her like a saddle. Thousands of visitors come here each day to pay respects.

Last fall I dived down to the wreck of the *Arizona* with Matt Russell, a National Park Service archaeologist, and I could see the oil as it eked from open hatches and formed into drops like black, liquid pearls before my face mask. Each pearl seemed to shudder as it

BY PRIIT J. VESILIND
NATIONAL GEOGRAPHIC SENIOR WRITER

PHOTOGRAPHS BY DAVID DOUBILET




rose and scattered on the surface of the water.

The National Park Service, which operates the memorial and the visitors center, estimates that the *Arizona* has leaked about a quart a day for nearly 60 years. At least a half million gallons of oil remain trapped and pose serious environmental risks. Many bulkheads and overheads of the ship have corroded and weakened. Some day the metal will collapse, and the stashed oil could roll into the harbor.

That threat lay at the heart of a major initiative last fall to document the condition of the U.S.S. *Arizona* and the U.S.S. *Utah*, a gunnery training vessel that also lies in Pearl Harbor waters. Kathy Billings, superintendent of the USS *Arizona* Memorial, says, "We needed to ask some basic questions: What's happening to the wrecks? Can we keep the ships longer than their natural span of deterioration? And do we even want to? Some feel that we should just let nature take its course, but others really feel that that symbol should be there 200 years from now. I'm torn between the two."

Billings is all no-nonsense, from her drive to



Never fired at an enemy, 14-inch guns of the U.S.S. *Arizona*, sunk by Japan, are inspected by National Park Service underwater archaeologist Dan Lenihan. Marine growth helps slow the corrosion of the guns' steel. Much of the *Arizona* was salvaged during World War II, but these guns were not found in Pearl Harbor's turbid waters until 1983.

catalog each detail of the ship to the straight blond hair that plummets from her ranger hat. She knows that she guards one of the nation's icons and that time is running out to make informed decisions. "We need scientific information," she says, "and then we have to weigh that with the emotional part of the site as a shrine."

Her nemesis—a dollop of No. 6 fuel oil from the *Arizona*—sits in a jar of water on her desk. When she turns the jar upside down, the oil oozes toward the top, dreamily, like a lava lamp. "We come up from diving sometimes with oil plastered in our hair," she says.

The oil that now escapes from the ship does little harm to the harbor's ecosystem, perhaps only affecting the abundant marine life that has formed in and on the wreck itself. The danger remains in a collapse of the fuel bunkers, which line the hull like a multichambered shell (pages 90-91).

Soon after Kathy Billings arrived in Pearl Harbor six years ago, she reached out to the Park Service's Submerged Resources Center (SRC) in Santa Fe, New Mexico, and jump-started a stalled preservation plan. With last fall's study she and two veteran diver-archaeologists from SRC, Dan Lenihan and Larry Murphy, enlivened an 18-year research effort to inventory the sunken ships, analyze the condition of the metal, and measure the oil remaining.

When the Park Service inherited the battleship site from the Navy in 1980, no real property assessment had been done. "There were live shells down there," Lenihan tells me, "and when we dived on the *Arizona* the first time, we found the entire forward 14-inch-gun turret, as big as a Greyhound bus, just below the level of light penetration in the harbor." The Park Service had been told, inaccurately, that all the big guns had been salvaged weeks after the attack and set up in shore batteries.

Research help came from Donald Johnson, John Makinson, and William Weins of the University of Nebraska, engineers who are studying the corrosion rate of the metal and the structural integrity of the ship. Pam Morris of the Medical University of South Carolina has been examining the effects of microbiological organisms on the structure.

With remotely operated cameras National Geographic photoengineers inspected the ship's



interior spaces. They used a “sea snake,” a television camera attached to a sinuous cable, to penetrate narrow spaces. They poked a digital camera mounted on a pole through the ports of officers’ quarters to reveal such details as the admiral’s encrusted chandelier and mirrored bureau.

The admiral himself, Isaac C. Kidd, died on the bridge of the *Arizona* on that infamous morning. Only his Naval Academy ring was found, fused by heat to the steel of the ship’s conning tower.

BECAUSE PEARL HARBOR was the worst naval disaster in the history of the United States, because it shattered the American myths of isolation and invincibility, and because it united the nation in outrage, its poignancy can touch even those who least expect it.

Larry Murphy, a bearded and barrel-chested ranger who has dived on hundreds of shipwrecks, says: “At first it was just another job, but the more I dove, the more the *Arizona* affected me. We are involved with this as Americans. We’re not looking at the *other*; we’re looking at the *us*.”

To the Japanese government the American people in 1941 looked divided and a bit spongy in the middle, without discipline. That gave

“The man who was my enemy yesterday is now my friend.” That Japanese proverb moves Zenji Abe (above), who first saw Pearl Harbor in 1941 from the cockpit of a dive-bomber. Dick Fiske (right), sounding taps on the *Arizona* Memorial, was a bugler on the U.S.S. *West Virginia* when a bomb penetrated the armored roof of a gun turret and stopped, unexploded, above ammunition stores. The two met in 1991 at a reunion in Hawaii. For a decade Abe has had two roses placed each month at the memorial’s roster of American dead, and Fiske plays taps over them.

Japan the confidence to act. Oil gave it the reason. Between 1931 and 1937 Japan had built a military-industrial complex that doubled its consumption of oil, most of which came from the United States. But over time the U.S. had imposed restrictions on oil exports to Japan, culminating in a full embargo in July 1941.

Some Japanese historians now say that their country could not accept this embargo without deep humiliation and was left no alternative. They suggest that Japan attacked Pearl Harbor as much to save face as to knock out American capability to defend Allied interests in the Pacific.

On November 26, 1941, even as Japanese diplomats negotiated in Washington, a strike

force of 31 warships slipped from Japan into the North Pacific. They steamed silently until they bore down on the Hawaiian Islands. A small floatplane made a high-altitude reconnaissance loop around the target and radioed back: "Pearl Harbor sleeps."

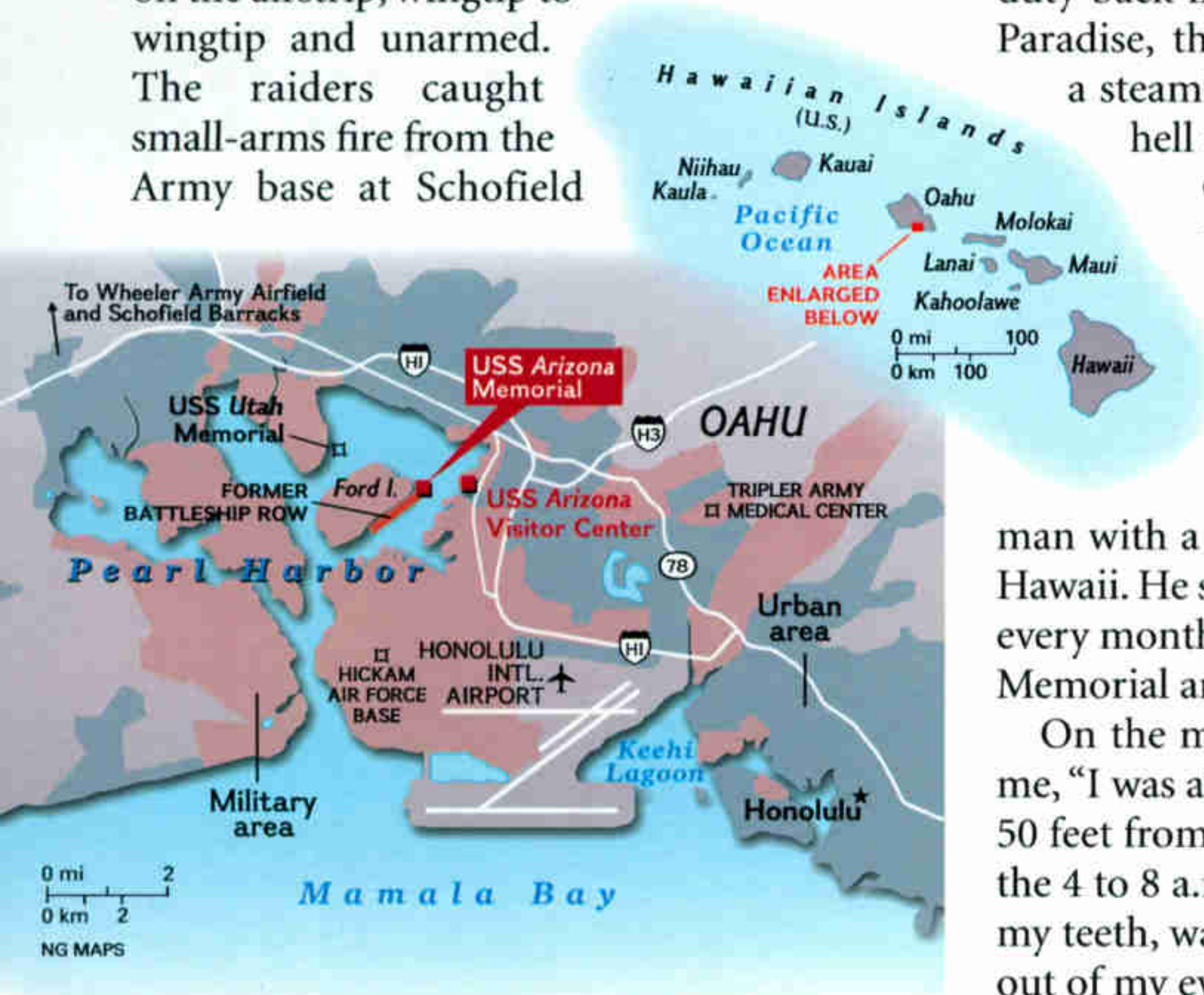
In the first wave of warplanes were fighters that veered in over the Waianae Range and roared down on Wheeler Army Airfield, where 140 American aircraft had been left helpless on the airstrip, wingtip to wingtip and unarmed. The raiders caught small-arms fire from the Army base at Schofield

Barracks before pivoting for their deadly run on other airfields. Bombers targeted Battleship Row.

In the 1960s, when I was an officer at the Naval Communications Station in the pineapple fields of central Oahu, and my wife taught school at Schofield, I saw the Waianae Range from my window every day. The Navy made sure we understood the price of being unprepared. It was easy enough to imagine myself on duty back in 1941: a fine Sunday morning in Paradise, the sun sifting through the palms, a steaming mug of Navy coffee. And then hell rains down.

Of the tens of thousands of servicemen who survived the attack on Hawaii, an estimated 8,000 are left. One is Dick Fiske, 79, a former Marine Corps bugler, who also lived through the battle for Iwo Jima. Fiske, a dapper man with a small gray mustache, now lives in Hawaii. He says his lip isn't always up for it, but every month he brings his bugle to the *Arizona* Memorial and blows taps.

On the morning of December 7, Fiske tells me, "I was aboard the U.S.S. *West Virginia*, just 50 feet from the bow of the *Arizona*, and I had the 4 to 8 a.m. watch. I went up there, brushed my teeth, washed my face, and got the sleepers out of my eyes." (Continued on page 96)

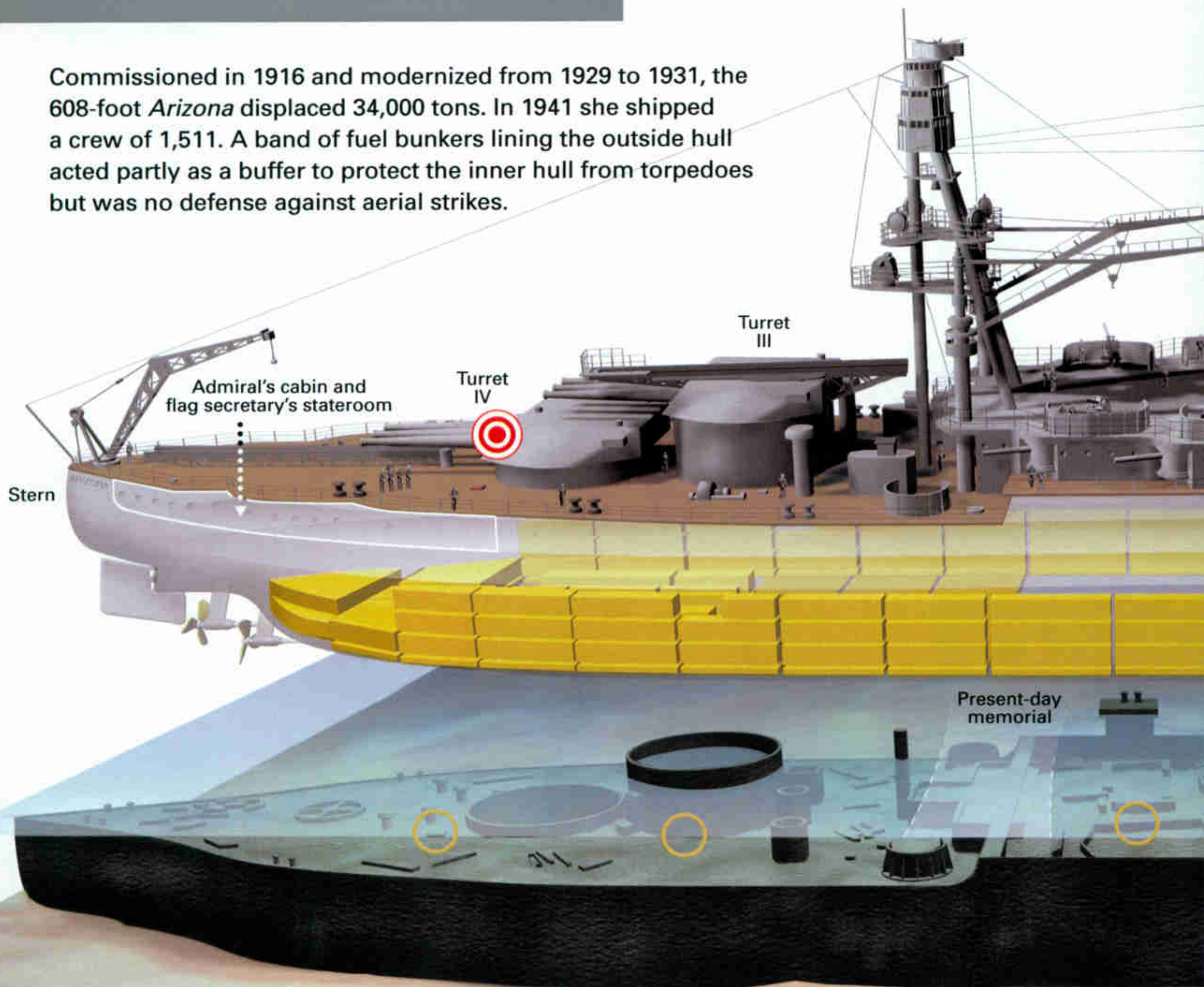




Globules of fuel oil continue to rise from leaks in *Arizona*'s hull and decks. Park Service archaeologist Larry Murphy inverts a tube to capture one. How much oil remains aboard is unknown, but perhaps a half million gallons. As the forces of sea and salt eat at the wreck, a major release of oil is likely.

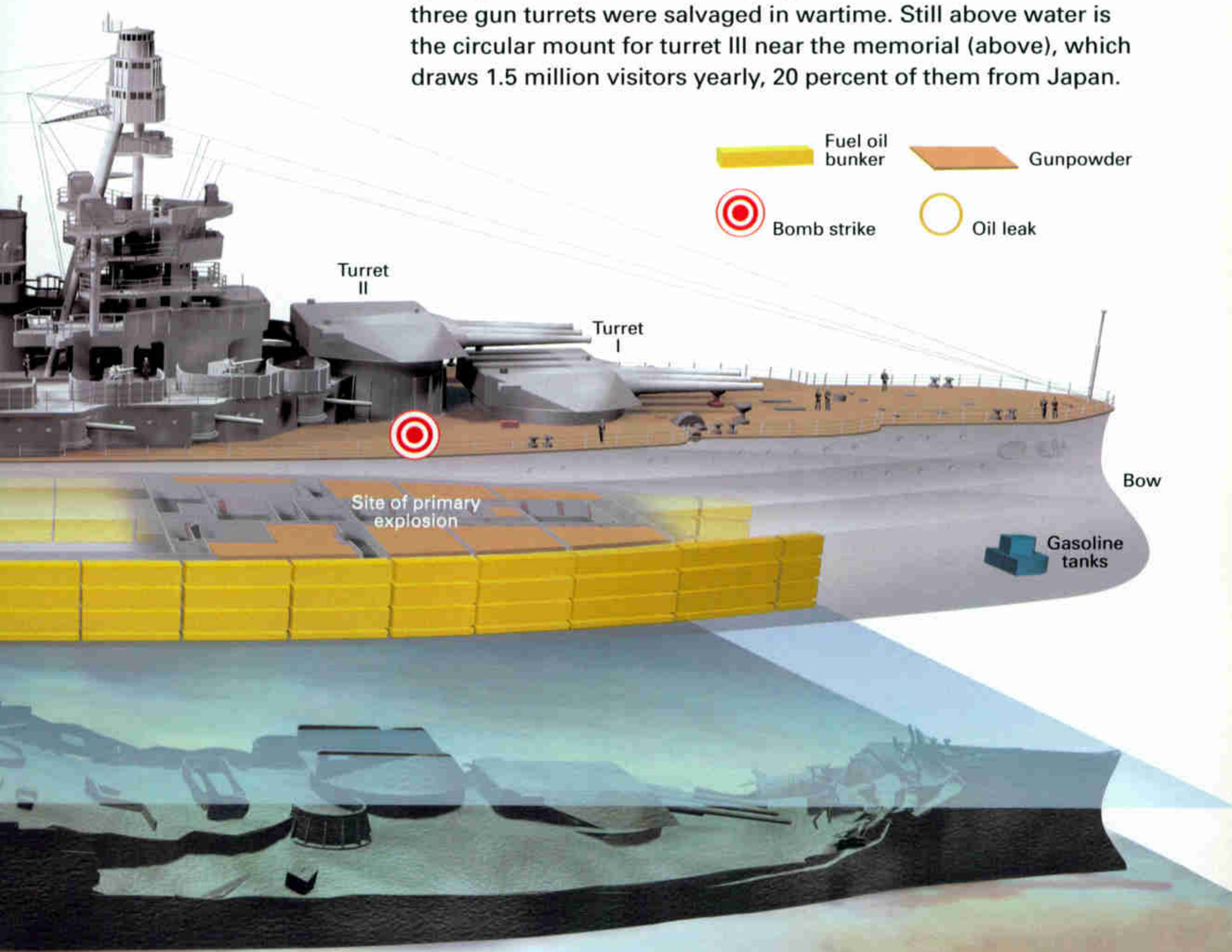
TARGET AND MEMORIAL

Commissioned in 1916 and modernized from 1929 to 1931, the 608-foot *Arizona* displaced 34,000 tons. In 1941 she shipped a crew of 1,511. A band of fuel bunkers lining the outside hull acted partly as a buffer to protect the inner hull from torpedoes but was no defense against aerial strikes.





The fatal bomb speared the *Arizona's* foredeck near turret II, igniting more than 500 tons of gunpowder. The superstructure and three gun turrets were salvaged in wartime. Still above water is the circular mount for turret III near the memorial (above), which draws 1.5 million visitors yearly, 20 percent of them from Japan.

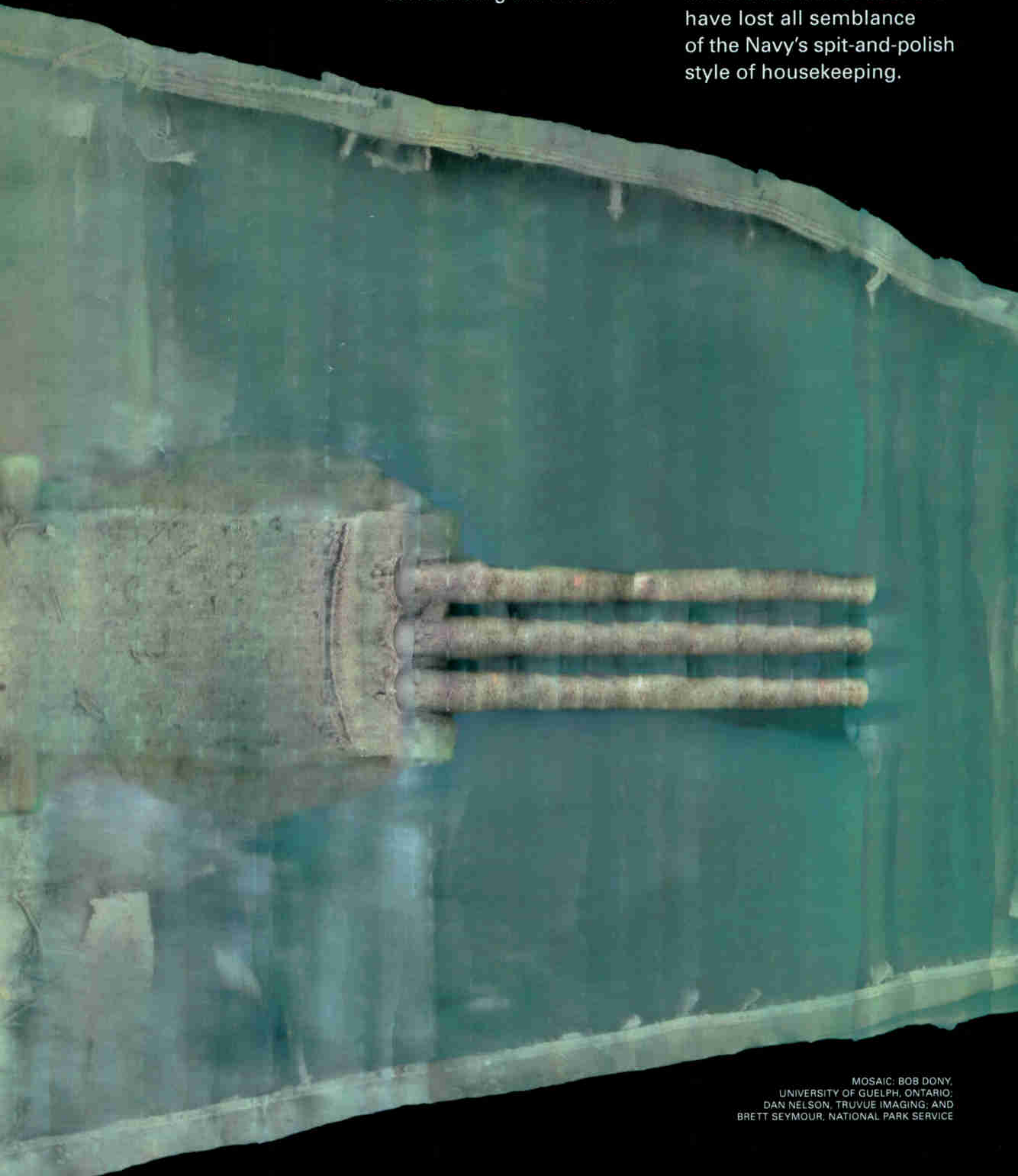


INSTANT AND ETERNITY

The colossal explosion that sent *Arizona* to the bottom in minutes vented forward of turret I, shredding the deck and hull, as seen in a mosaic (below) compiled

using software that integrates row upon row of digital video images. The result is a view of unprecedented clarity impossible to achieve with conventional photography given the murkiness of water surrounding the wreck.

For 60 years silt deposited by those waters has accumulated within the hull, and marine organisms have attached themselves to most surfaces. In the admiral's cabin (right, left to right) a sideboard with crockery still intact and a mirror above it have lost all semblance of the Navy's spit-and-polish style of housekeeping.

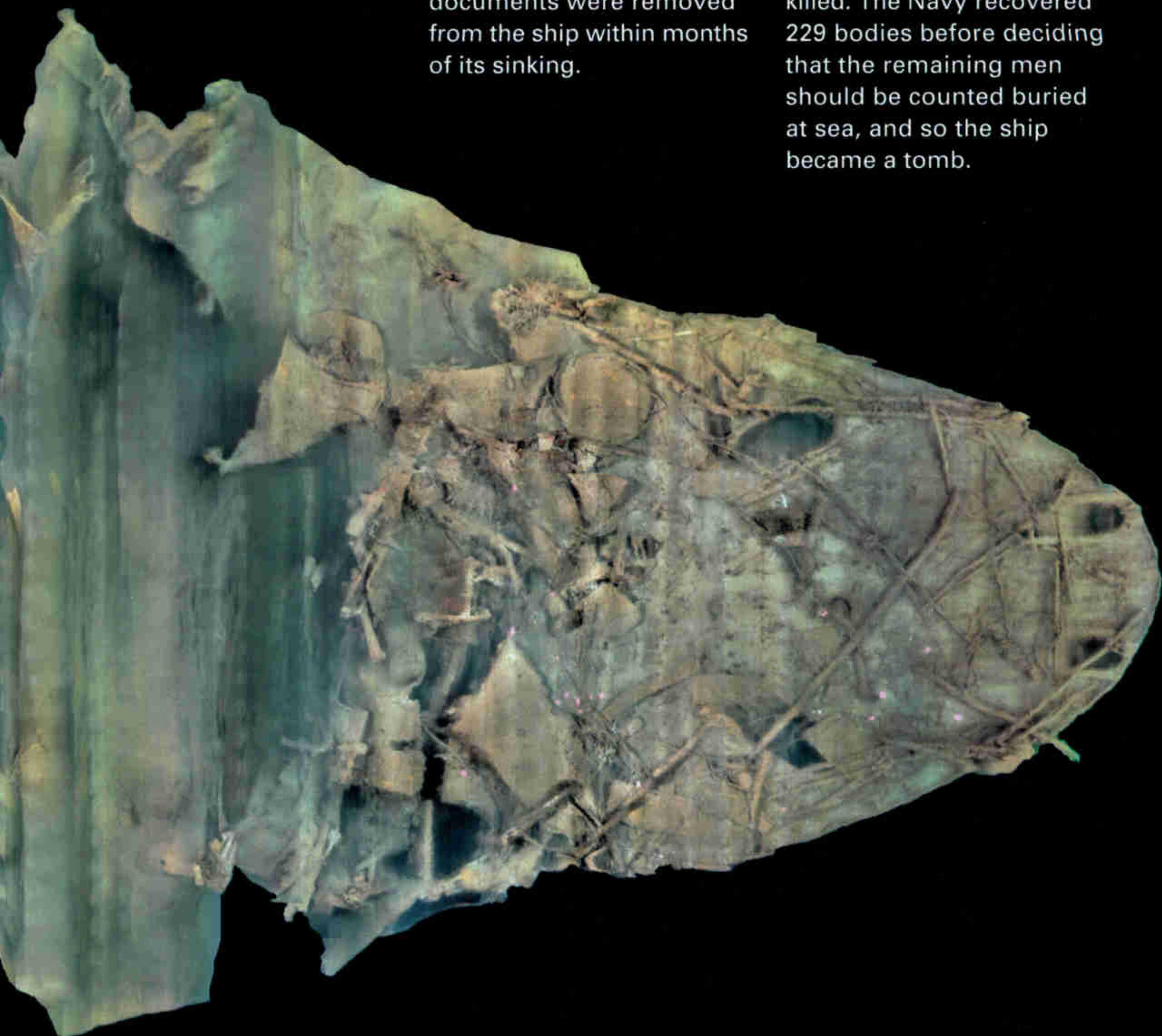


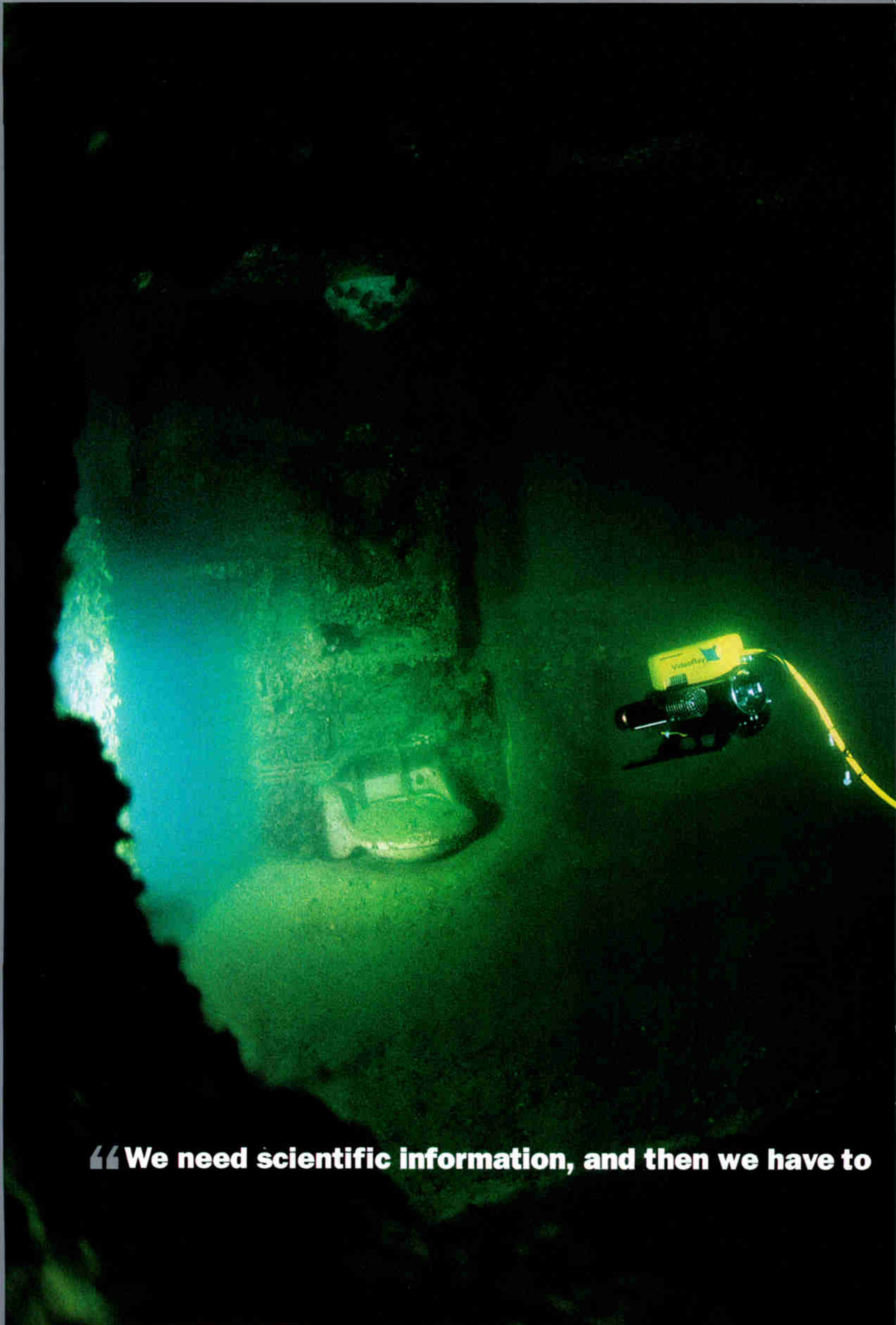


ALL BY EMORY KRISTOF AND KEITH MOOREHEAD, NGS

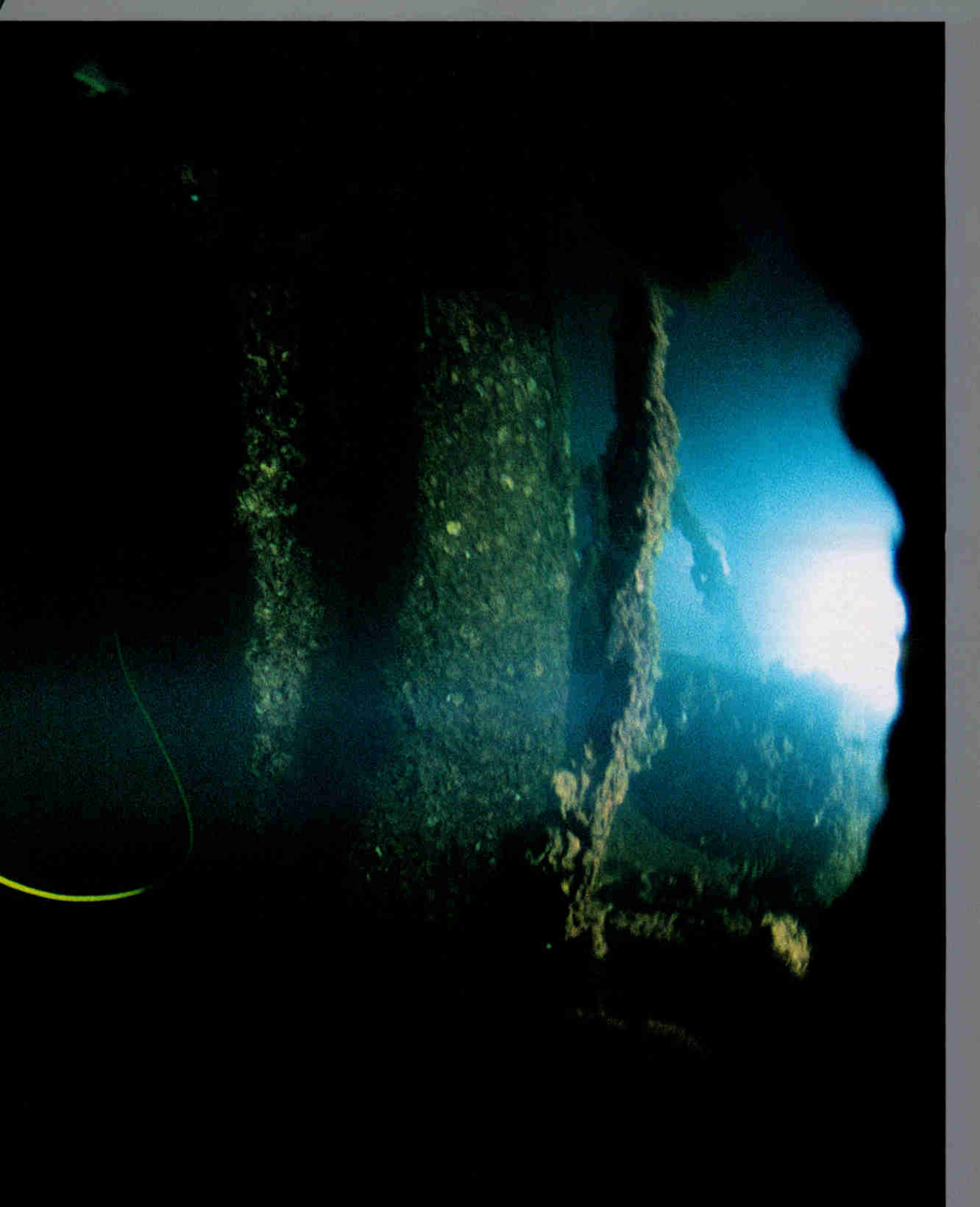
A blue lightbulb remains unbroken on the encrusted wiring of a fixture where a feather duster worm has taken up residence. Safes, valuables, and sensitive documents were removed from the ship within months of its sinking.

Springs and part of a chair frame have not yet succumbed to silt and corrosion. Rear Adm. Isaac Kidd and 1,176 other officers and men aboard were killed. The Navy recovered 229 bodies before deciding that the remaining men should be counted buried at sea, and so the ship became a tomb.





“We need scientific information, and then we have to



weigh that with the emotional part of the site as a shrine. ”

To preserve a sense of sanctity and for safety, human divers are not allowed to enter the decaying hull. A self-propelled mini-ROV the size of a bread box documents the interior and here traverses the flag secretary's stateroom.

(Continued from page 89) I blew reveille at 5:30. Because it was Sunday, we could sleep half an hour late. And then I sounded chow call at 6:30. I had just gotten permission to sound colors when we see all of these planes, a flock of them, and they had torpedoes on them.

“And by the time you saw that red ball on their wings, those torpedoes hit. The force of the explosions blew Stanley Bokowski and me across the ship to the starboard side, 118 feet away, and covered us with oil.”

West Virginia absorbed nine aerial torpedoes, which killed 106, including her captain. The *Arizona* took a bomb. It penetrated the forward magazine, igniting more than a million pounds of ammunition, virtually vaporizing more than a thousand men. “It was the most hellish fireball,” says Fiske.

“Then somebody hollered, ‘Abandon ship!’ And so a bunch of us went to the forward bow and dove off. And that’s all I remember till we landed on Ford Island, about 40 yards away.

“I know I got there, because I was soaking wet, covered with oil. But why couldn’t I remember the swim? There was fire in the water, but why the hell can’t I remember, just those 40 to 50 yards? I keep wracking my memory.”

In minutes flaming oil raged across Pearl Harbor, and smoke towered so high and thick that the Japanese pilots lost their targets and had to come around again. By then they were picking their way through blistering anti-aircraft fire, but they had crippled the heart of the U.S. Pacific Fleet at its moorings.

Despite their obsession with oil, the Japanese committed a costly blunder when they failed to destroy ship-repair facilities and oil storage tanks, brimming with 190 million gallons. The loss of the tank farms, said Adm. Husband E. Kimmel, then commander of the Pacific Fleet, “would have forced the withdrawal of the fleet to the coast because there wasn’t any oil anywhere else out there to keep the fleet operating.”

Charles Christensen, now retired in Louisville, Kentucky, was a fireman 2nd class on the U.S.S. *Argonne*, a repair ship moored to Pearl Harbor’s Pier 1010. Before the attack waves ended, he was recruited to assist with survivors who had been plucked from the water.



U.S. NAVAL HISTORICAL CENTER

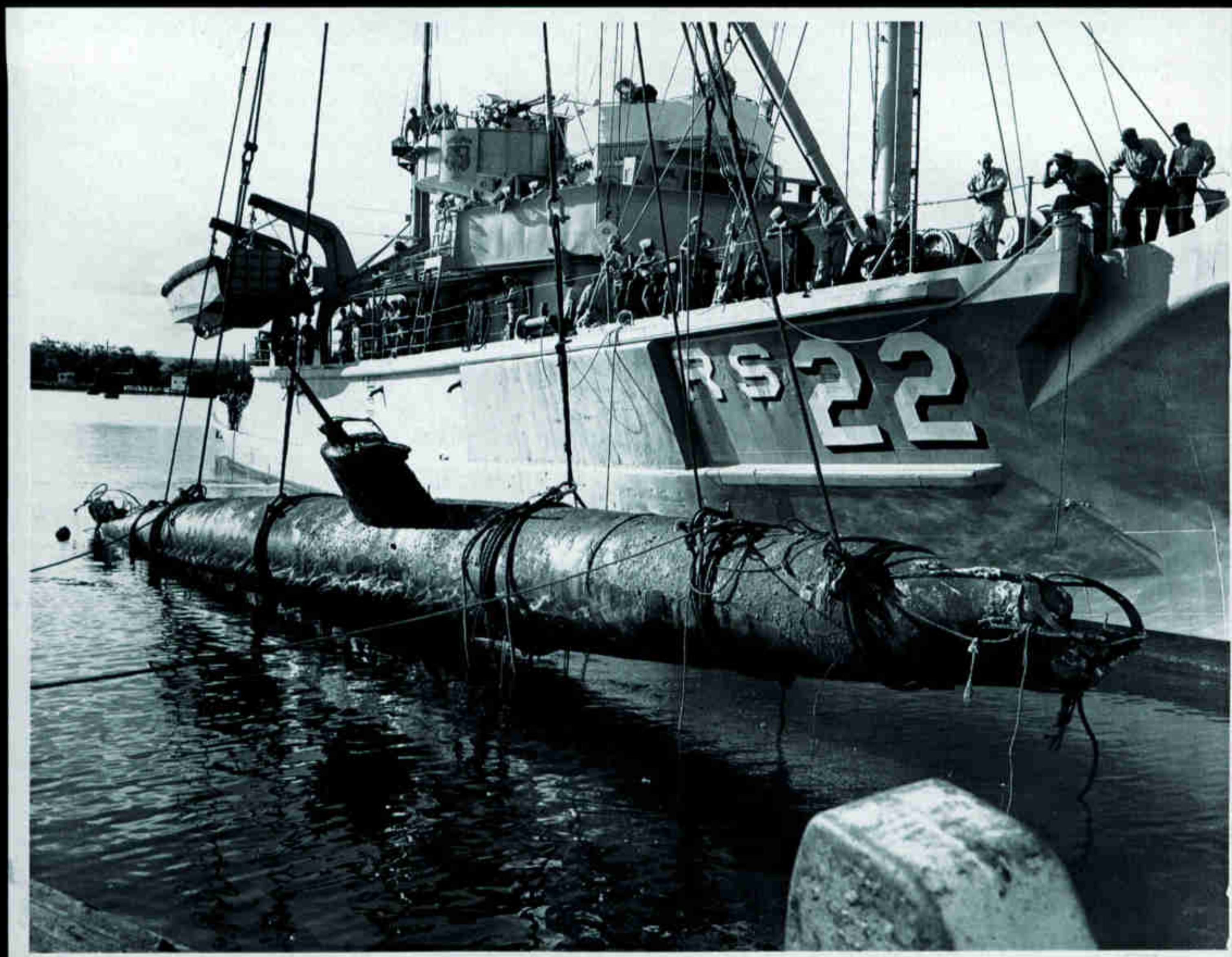
STEALTH MISSION FROM BELOW

On the night of December 6, 1941, hours before the airborne attack, five large Japanese “mother subs,” each with a 79-foot-long midget submarine clamped to its deck, had formed a semi-circle around the mouth of Pearl Harbor. The two-man midgets were to slip into the harbor before dawn and wait on the bottom, prepared to attack.

Each crewman had written a farewell to his family and prepared for a samurai’s death. Nine of the ten, who posed for a pre-mission portrait (below), were lost, and



JAPANESE MIDGET SUBMARINES



USS ARIZONA MEMORIAL, NATIONAL PARK SERVICE (ABOVE AND BOTTOM LEFT)

in their martyrdom were elevated to hero-gods by propagandists who wanted to stoke Japan's spirit of sacrifice.

The midget subs, the Japanese government claimed, had sunk the *Arizona*. In reality, their mission was a failure. The U.S.S. *Ward*, an American destroyer, engaged one midget on the surface at 6:45 Sunday morning, thus firing the first shot of the Pacific war. The second round doomed it. Although the *Ward* reported the incident to headquarters, the message rattled around the chain of command until it was too

late. That midget has not been found, despite several intense searches.

The destroyer U.S.S. *Monaghan* rammed and sank a second midget. It was later raised and buried in a local landfill. A third midget ran aground on Oahu's northeast coast. One crewman died, but Ensign Kazuo Sakamaki washed up on shore alive and was captured. He became the United States' first World War II prisoner.

Military intelligence sliced up Sakamaki's craft like a sausage. Here an inspector (top left) peers into the aft section at battery

racks. Today the sub is on view at the National Museum of the Pacific War in Fredericksburg, Texas.

The fourth sub was found in 1960 in Keehi Lagoon. It was salvaged by the U.S.S. *Current* (above), sent to Japan, and is displayed at the military school at Eta-jima. No trace of the fifth midget has been found, although an aerial photograph taken by a Japanese pilot shows what may be a sub launching torpedoes at American ships during the air raid. Even after 60 years Pearl Harbor continues to generate new history and new mysteries.

“Most of them had come out of the oil slick, swimming in the fire and the oil,” he says, “and they were just soaked in oil—their hair and ears and eyes—and they were burned so bad that the skin was just falling off of them. The doctors were there with boxes of hypodermic needles, giving them morphine shots. The whites of their eyes were just as red as they can be. . . . I can still see it today.”

A MONTH AFTER the attack Navy teams were salvaging guns and usable hardware from the battleship. Divers wearing heavy copper helmets were bringing up safes, record books, and live ordnance. Metalsmith 1st Class Edward Raymer was first to penetrate the *Arizona*. In his recent war memoir, *Descent into Darkness*, he writes how “viscous oil thickly layered everything in the harbor. The hulls of ships and the pilings on docks were coated with it, and the entire shoreline was blackened.”

When he dived to the battleship, “the dense floating mass of oil blotted out all daylight. I was submerged in total blackness.” Lights were useless because they reflected directly back into the diver’s eyes. Instructed to find and disarm an unexploded torpedo, Raymer groped his way through the spaces of the *Arizona*’s third deck, trailing an air hose connected to a pump topside. “I got the eerie feeling again that I wasn’t alone. Something was near. I felt the body floating above me.”

Raymer’s movement through the water had created a suction that drew floating corpses to him, bodies with heads and hands picked clean by scavenger crabs.

“Their skeletal fingers brushed across my copper helmet,” he remembers in horror. “The sound reminded me of the tinkle of oriental wind chimes.”

Medics wearing gas masks against nausea gathered only 229 *Arizona* dead from the waters before the Navy reluctantly decided to leave the rest untouched.

“Remember that it’s a tomb,” says Deborah King, a Park Service dive officer, as I slip into scuba gear for my first dive to the ship. King, a baby-faced and perpetually wet-headed ranger who has logged more than 90 dives to inventory and map artifacts on the *Arizona*’s deck, takes any breach of etiquette personally.

The *Arizona* is now an artificial reef adorned

with lacy tube worms and corals that live among the cracks and holes of the steel plate as if in condominiums. A class of two-foot-long parrotfish, cast in midnight blue, glides and dips by. The intact teak deck of the *Arizona* lies bare where a sergeant major fish has fanned off sediment with its tail and laid a purple glob of eggs.

Visibility is poor, ten feet at best, and ship parts emerge like phantoms. The 14-inch guns, which once swiveled like panzer turrets and rained deadly 1,500-pound shells as far away as 20 miles, rest impotent. Puffers dawdle in their gaping bores.

Our cameras peer through the glass of encrusted portholes; our small submersible noses through silent spaces, but we see no human remains. In the ship’s galley, ripped open to the sea, a milk bottle lies among the collapsed shelving, pots, and broken dishes. There’s a shoe with brown laces flopping, and a Coca-Cola bottle.

Park Service plans never included going inside the ship; that was deemed disrespectful, and too hazardous. There is no doubt that the *Arizona* is deteriorating; the bulkheads below-decks are thin and shredded, the metal on the starboard side may be weakening. The oil is leaking faster and from more places. But Kathy Billings now has her inventory of artifacts and an accurate mapping of the *Arizona*. The Park Service will monitor the underwater wreck for changes in the corrosion rate and to detect theft by unauthorized divers.

Some day, some way, the oil will stop flowing, but that will be a hollow victory for some, even at the Park Service. Says Daniel Martinez, historian for the USS *Arizona* Memorial, “I’d be terribly troubled if there was an attempt to stop the flow of oil—terribly troubled. I know what it symbolizes, as a historian and as an American. The tragedy is reflected in the oil.”

WHEN THE WAR ENDED, Dick Fiske was consumed by hate. “And I’m ashamed of it,” he says. “I hated so much that it gave me bleeding ulcers. I was in Tripler hospital for about three months, and they cut out part of my stomach, and I have about six wires still inside. They thought I was gone.

“When I woke up, Dr. Levine came in, and

he's smoking a big cigar, and he says, 'Sarge, what in the hell is eating you?' I says, 'I don't know, but I think a truck ran over me.' I was sore. And he looked at me, and he says—pointing to my gut—'I can cure that, but'—and he points to my head—'I can't cure that.'

"I says, 'What do you mean?' He says, 'I went through your record.' He says, 'Good God, Sarge, who do you hate?'

"And then I realized, 'Oh, my God. I know now.' I had put it in the back of my head. . . . I hated all that killing, and I hated the Japanese,

has become a touchstone for the World War II generation, not only a reminder of their sacrifice but also a place of reconciliation. In 1983 Dick Fiske began to volunteer there, to help introduce the film that precedes the boat trip to the memorial. He has traveled to Japan and now counts among his good friends a man named Zenji Abe, a dive-bomb pilot and part of the attack force.

Hundreds of thousands of Japanese visit Hawaii every year, and many visit the *Arizona* Memorial, but few know much about the



An open hatch, from which *Arizona's* crewmen once emerged smartly for duty and eagerly for shore liberty, no longer rings with drumming footfalls but only the muffled cadences of memory.

and . . . and then he says, 'You got to get rid of that, Sarge, or you're not going to make it.' And we talked for about an hour, and when he left, I was bawling like a baby, but it felt like I had a 500-pound weight taken off my shoulders and I could breathe."

Over the years the USS *Arizona* Memorial

Pacific war. Japanese schools gloss over it. But on the day before I arrived, a squadron of young Japanese naval officers had come to pay respects, to bow their heads and offer a moment of silence to the fallen warriors of both sides. And some Japanese visitors have written in the guest book. One entry, unsigned, rings like haiku: "Shock pierced through my heart. We come from Hiroshima. . . ." □

MORE ON OUR WEBSITE

Experience the attack on Pearl Harbor through a narrated interactive map and contribute to an online memory book at nationalgeographic.com/pearlharbor.

Ancestral pillars ascend the stairs of the Great Mosque in Djénné, Mali's sacred city of uncommon beauty on the edge of the Sahara. Drawing on ancient traditions, Djénné's people have survived drought and political turmoil. Now rebuilding after decades of little rain, they confront modern threats, including a dam upstream on the Bani, the river that sustains them.



DJÉNNÉ

WEST AFRICA'S ETERNAL CITY



BY KAREN E. LANGE
NATIONAL GEOGRAPHIC EDITORIAL STAFF

PHOTOGRAPHS BY SARAH LEEN





Mud-spattered schoolboys take a break from carrying plaster to masons repairing a house. During droughts in the 1970s and '80s, many Djénné families were unable to replaster their houses, which slowly melted in the short but intense wet season rains. Now foreign money is restoring them. Maintained, they will last generations.

PERCHED BAREFOOT atop a single row of mud bricks 20 feet above the ground, two masons are laying fresh courses on the wall of an ancient house. From the second floor their boss grabs a seven-pound block off a pile and heaves it up with careless assurance. The workman closest plucks it from the air and bends to place it on the wall. With perfect timing the head mason lobs another brick over the back of the first workman. The second catches it with ease. And so it continues, the two masons catching the bricks and setting them in place, the front man ducking so every other brick can reach his partner, their bodies rising and falling rhythmically under an intense sun. Not a single brick escapes them to fall into the narrow dirt street below. Not a single time does either lose his balance.

A Western visitor to this city in Mali might call this display skill. Djénné's masons call it magic. "In all the world no one can build in mud like us," said Béré Yonou, one of the city's master masons. "What we know is the earth." The masons, whose family lines stretch back half a millennium, mix clay dug from the surrounding plains with water from the Bani, a tributary of the Niger. Then, drawing on knowledge passed from father to son, they create an architecture that brings visitors from as far away as Japan. The Great Mosque, with its crenellated walls, is the most stunning example, but even the more humble buildings, their pillars and buttresses tapering to narrow fingers that project above the city's flat roofs, are masterpieces of Sudanese architecture. As early as the 14th century, the style spread from the Djénné area across the Sahel of West Africa, becoming synonymous with the city's masons.

The beauty of Djénné is fragile. Buildings must be replastered regularly or they melt under the seasonal rains. During the severe droughts of the 1970s and '80s, houses were abandoned or neglected. When rain fell, the replastering hadn't been done. Djénné's majesty began to fade.

Now a grant of \$500,000 from the Netherlands is allowing Djénné to restore 168—about an eighth—of the city's dwellings. Residents pay nothing for the repairs but must agree to keep their houses traditional, with small windows, modest-size rooms, and mud construction—this at a time when some people are razing whole buildings to put in electricity, plumbing, and rooms big enough for armoires. The restoration, scheduled to be finished next year, is being done according to tradition, with the masons dividing up the work according to whose ancestors originally built the houses. Through *gris-gris*, or spells, masons protect the houses, the families that inhabit them, and themselves: Dirt from old brick is reused only within the dwelling from which it came, since it is believed to carry a blessing that cannot be transferred.

The roots of such practices stretch back to 250 B.C. and the beginnings of Jenne-jeno, an ancient site two miles from Djénné. Archaeologists believe the essential character of Jenne-jeno's culture endures in Djénné. "Resilience is the key word," writes Roderick McIntosh, who with his collaborator, Susan McIntosh, excavated Jenne-jeno.



MUD MAJESTY

Sweeping away debris from the weekly market, women prepare for Independence Day celebrations in front of the Great Mosque. The building, descendant of one erected in the 1200s, stands as a sublime example of the architecture that made Djenné famous, a mixture of sub-Saharan and North African styles. In the colonial 1890s a Frenchman wrote, "For the first time in these regions I was astounded by the work of man."

The Djennenké, as residents of the city are known, have survived centuries of drought and conquest by holding fast to their traditions.

Today, as they emerge from another drought and a corrupt dictatorship that ended in 1991, they confront the double-edged benefits of progress. For example, new metal pipes may bring running water into a house, but old pottery drainage pipes let it seep into the clay walls. Meanwhile, a dam for irrigation is being built on the Bani River at Talo, a town 90 miles upstream from Djenné. Fed by rains in Guinea and Côte d'Ivoire, the Bani jumps its banks each wet season and spills across the plain around Djenné. The flood creates channels for fishing, wetlands for growing rice, and marshes thick with grasses for cattle. It also creates soil uniquely suited to the needs of Djenné's masons, enriched with fish bones, crop stubble, and cow manure so that it becomes the perfect clay for making mud bricks. Many in Djenné believe the dam will cut off the Bani, the city's lifeblood, forcing them to abandon ancient ways.

To understand the traditions that sustain Djenné, one afternoon I followed Moctar Cissé, my 24-year-old guide, to the house of Béré Yonou, the master mason. He lives near Djenné's dusty main square, where the few streets wide enough for vehicles come together. In one corner of the square a handful of boys were kicking a soccer ball. Bells jingled as a donkey trotted by, pulling a cart full of grass for livestock.

We passed through a maze of alleys flanked by the smooth, sunbaked



brown walls of mud houses. Hot coals glowed in a dark interior, where a craftsman was bent over an anvil hammering silver. Beyond, old men sat in the street with their legs stretched out, weaving nets pegged to their toes. A woman sold sardine-size fresh fish from an enamel pan. The thump of a wooden pestle in a mortar carried into the street from an unseen courtyard. Farther on boys crowded the entryway of a Koranic school, chanting verses for their teacher, or marabout.

Power lines to streetlights, a recent addition, snaked over our heads. At a communal faucet women and children filled buckets with water to tote home. Mali's democratic government extended the city's electric and water systems in the 1990s, but most people cannot afford to have either brought into their homes.

"Watch out!" Cissé said.

I narrowly missed a shower of dirty water pouring out of a clay pipe overhead—drainage from a home with running water. The stream trickled into the middle of the street, where sewage stood as thick as oatmeal.

WE REACHED Yonou's place. I had expected a house that echoed the grandeur of Djénné's mosque. But the home, built by his grandfather, was plain on the outside, with corrugated metal shutters. Inside I noticed the trademark pattern of Djénné's builders—beams laid slantwise in the corners of the ceiling to support weight without posts or piers. There are some cinder-block buildings in Djénné, but nearly all houses are still built the traditional way, which costs less and insulates better.

We passed through a courtyard kitchen, where a pot of *bouilli*—a sweet rice porridge—was boiling over a fire, and sat on mats in a soot-blackened room with a television against one wall. Yonou wore a brown robe and clutched a string of prayer beads.

For as far back as anyone knows, Yonou's family have been masons. He started in 1950 as an apprentice to his father. In 1978 he became one of the city's master masons. Yonou is the last person alive to have been taught the technique of *djennefere*—building with the cylindrical bricks used in the city before the early 1900s, when the French introduced rectangular blocks. Still, he said, it is not so much the shape of the brick that matters; it is the care used in making and laying it.

"Some people are in a big hurry. I tell them to slow down."

Bricks should fit together tightly, with as little mortar as possible between them, he said. He slapped two sneakers together so the heel of one was cradled in the instep of the other.

"Those who listen to their master, learn. Those who don't, don't."

But there is more to the mason's tradition than love of the craft and respect for elders. "To be a great mason," he said, "one must study. One must know the Koran." The Koran is the source of the blessing that is placed on each dwelling, Yonou said. His mastery of masonry depends on his mastery of the holy book. That knowledge, in turn, gives him power. He looked me in the eye and pointed at the ground with one of his fingers.

"I can make a man's work fall down, without ever leaving my house,"



The Bani River turns Djénné into an island each rainy season. Its floodwaters made possible the fishing, farming, and herding that centuries ago fed the trans-Saharan caravans of Timbuktu. Today little is exported from Djénné, but the river allows the city to feed its own. Citizens fear it will wither if a dam is completed at Talo.





Cloistered in middle-class comfort, women plait hair and apply henna, preparing for Ramadan's end, when they will put on their finest dresses. Far from West Africa's economic centers, Djénné's people still enjoy enough prosperity that all but the poorest buy new clothes for the holiday.



he said. “I can make a man’s hands wounded so that they never heal—or I can heal them.”

I would soon find out that such power draws on traditions that predate the Koran. Yonou hinted at them: “It is not everybody who can build a house. It is a secret between the owner and the mason.”

ON THE OTHER SIDE of Djénné, a Malian-American team of archaeologists led by the McIntoshes was uncovering artifacts that show the long history of Yonou’s beliefs. North of the mosque the team had cut a trench 20 feet into the ground, carrying out the first excavation ever within Djénné. With shovels and short-handled

African hoes, they dug down through a thick layer of plastic bags and shreds of cloth, then through the concrete floor of a colonial-era clinic and the remains of shoddy mud bricks made by forced labor. They sifted through bucketfuls of dry soil, raising acrid clouds of dust. Finally, they began to find sherds similar to those in the most recent deposits at Jenne-jeno.

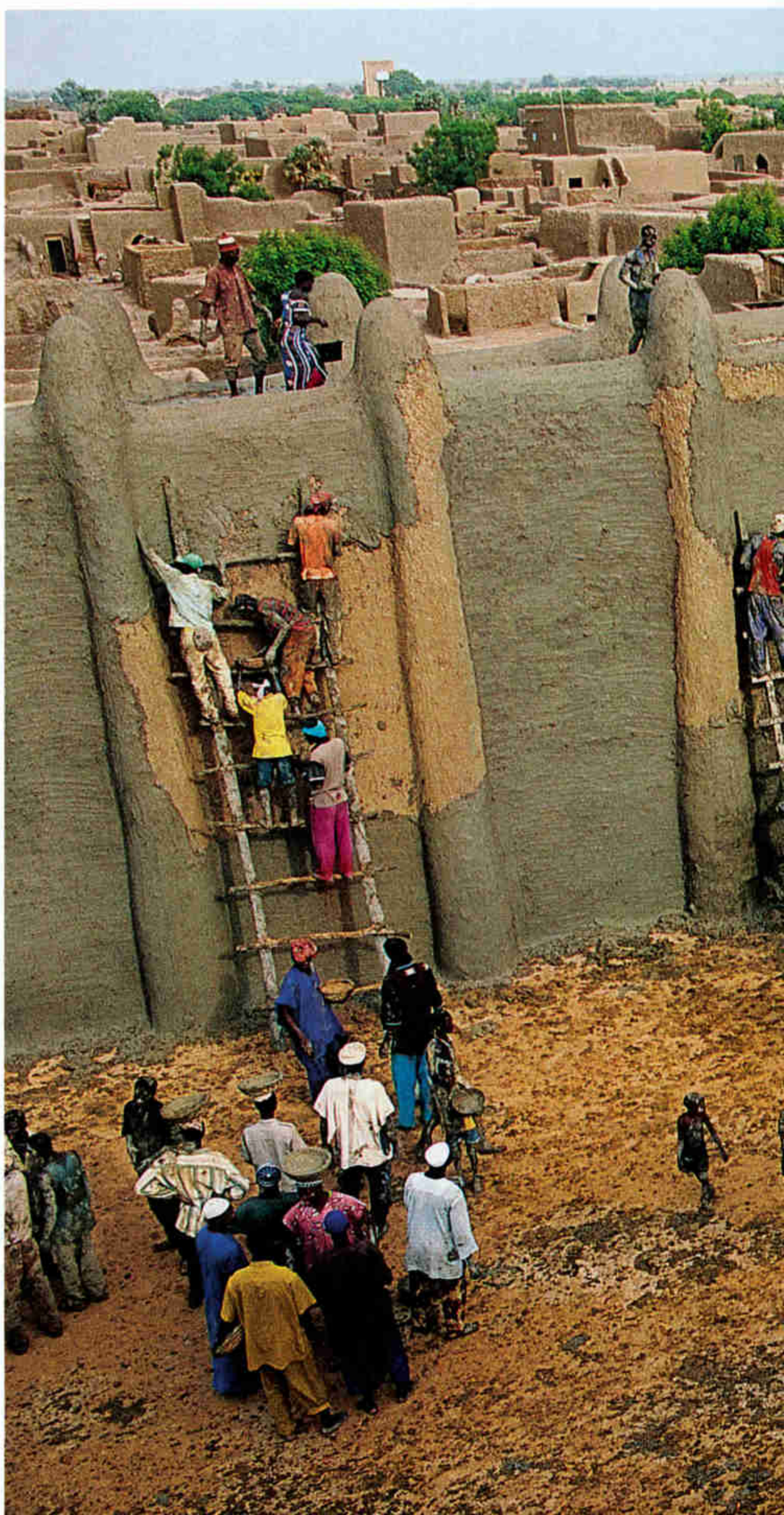
In the base of a wall from about A.D. 1400 they found fragments of a type of bowl the Djennenké still place in foundations for protection. One fragment carried magical grids of squares; another was inscribed with a benediction in Arabic; the third had the date 512—or, adjusting from the Islamic calendar, A.D. 1118. Here was evidence that Djénné and Jenne-jeno are linked.

The McIntoshes describe Jenne-jeno as a “city without a citadel.” There was no royal palace or ruler with an army. Instead, different ethnic groups, each with its own specialty, formed a kind of loose democracy. The groups—fishers, farmers, herders—lived and worked separately, each governing its own affairs. They came together to trade and decide community affairs. This system, which continues today in Djénné, allowed Jenne-jeno’s inhabitants to survive in a challenging environment.

After 1100 Jenne-jeno shrank, and by the 14th century, as the trans-Saharan trade in salt and gold fed the growth of a new city—Djénné—Jenne-jeno was abandoned. Arab

NEW SKIN

Volunteers scale inner courtyard walls in a race to finish replastering the Great Mosque in the annual crépissage—part contest, part festival, part hallowed tradition.



traders brought Islam, and Djénné became a Muslim center of piety and learning. Jenne-jeno, the source of the city's pre-Islamic traditions, was largely forgotten.

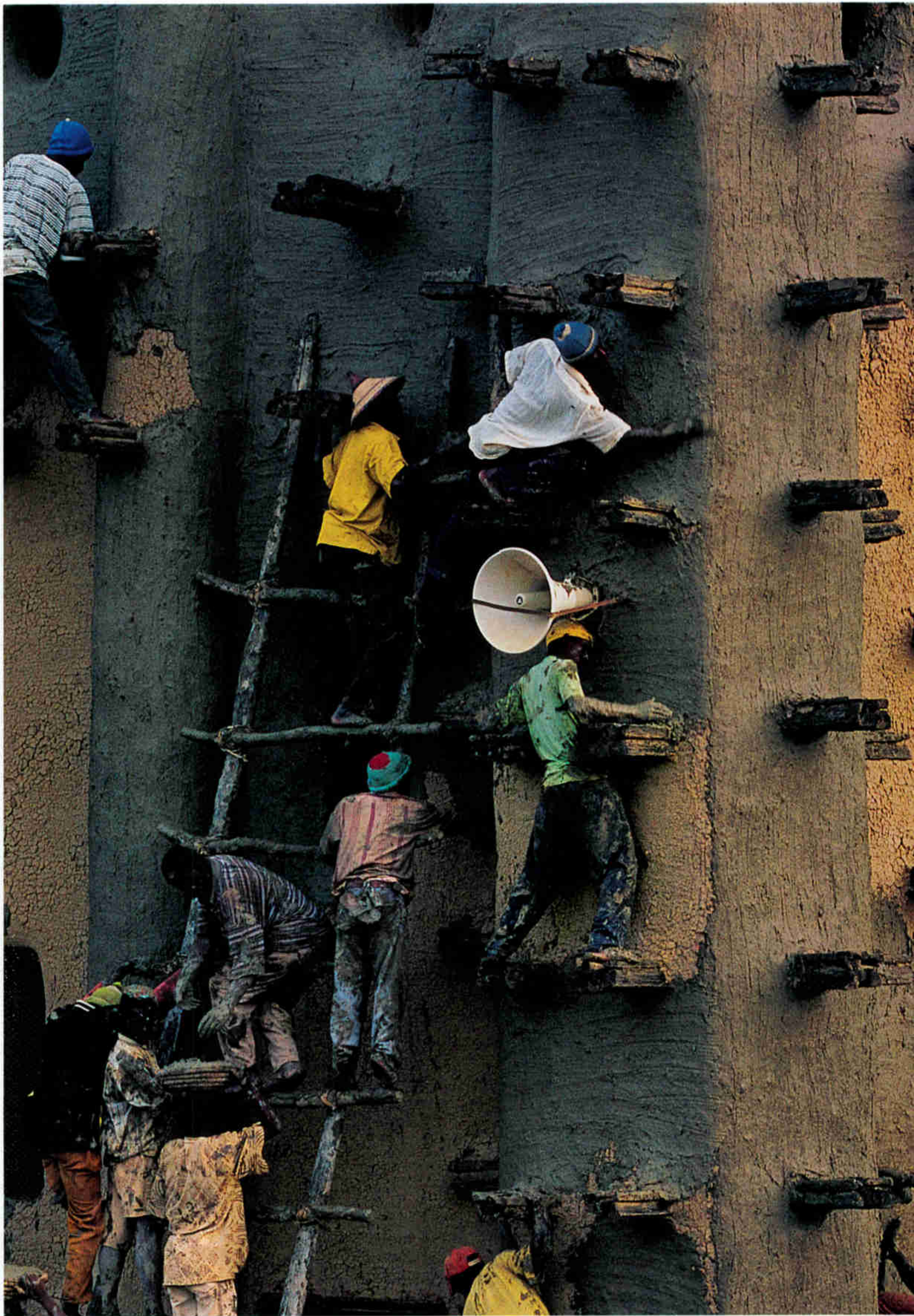
Before archaeology revealed the connection between Djénné and Jenne-jeno, Bia Bia, one of the city's marabouts, already understood it from his family's own written history. Sitting on the patio of the hotel where the archaeologists gathered for beers each evening, Roderick McIntosh told me to listen carefully when I met the teacher.

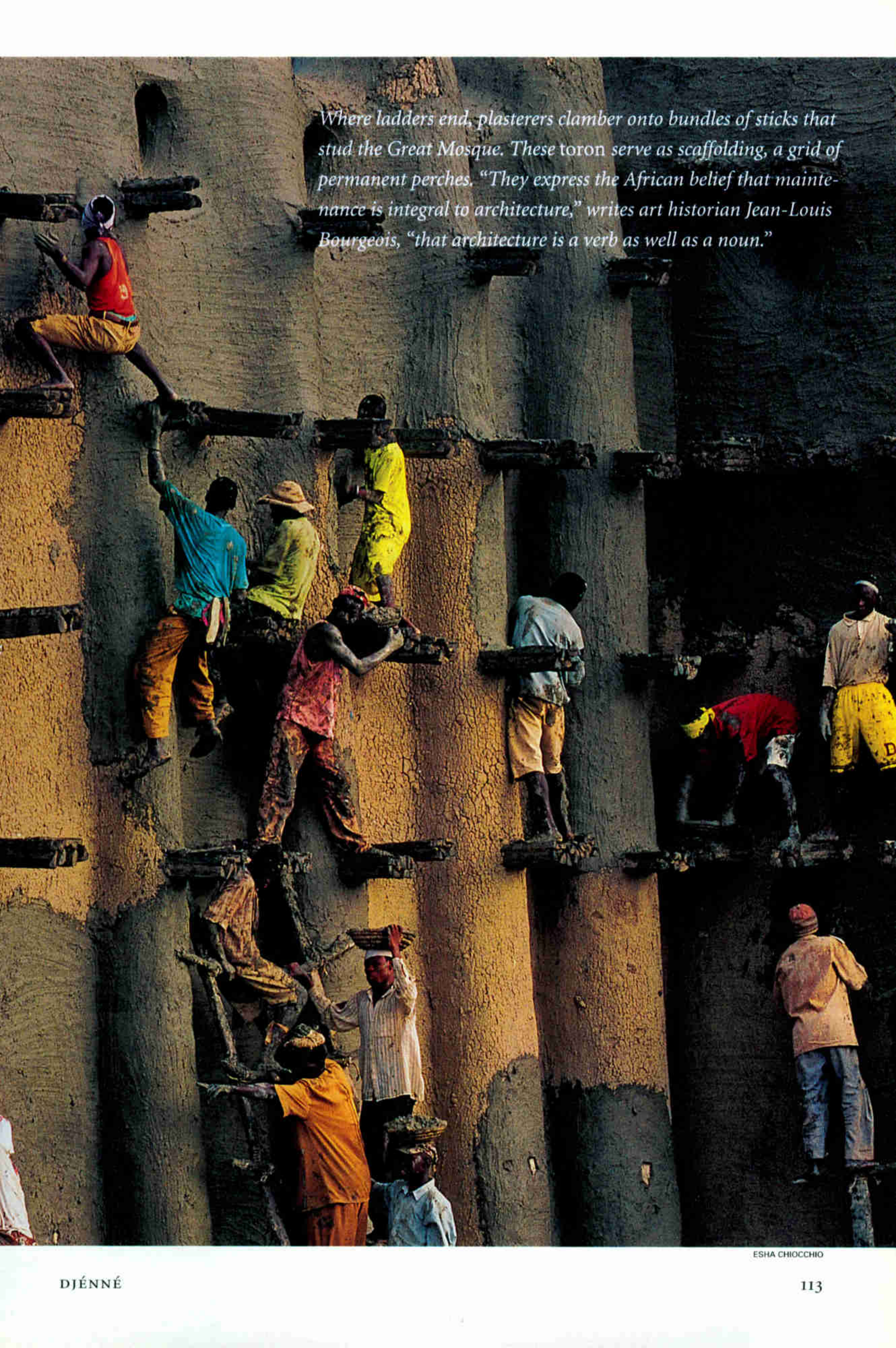
"Bia Bia speaks in code words. If he uses the terms *érudition* or *écriture* [writing], he is talking about Islam. But if he uses the term *connaissance* [knowledge], he is referring to Mande beliefs."

Mande culture stretches across West Africa. At its core is the idea of *nyama*: a life force tapped by experts to wield supernatural power.

ESHA CHIOCCIO







Where ladders end, plasterers clamber onto bundles of sticks that stud the Great Mosque. These toron serve as scaffolding, a grid of permanent perches. "They express the African belief that maintenance is integral to architecture," writes art historian Jean-Louis Bourgeois, "that architecture is a verb as well as a noun."

Masons, who shape earth itself, control nyama. Roderick McIntosh believes that in ancient Jenne-jeno one type of expert was respected above all others for his control of nyama: the blacksmith, with his ability to transform earth into iron with fire. In Djénné today authority derives from the Koran. No one uses the term nyama. Yet the tradition continues.

I found Bia Bia wearing a simple blue robe, sitting cross-legged in an open-air hallway on the second story of one of the four houses his skill as a marabout has brought him. He is a big man with a lined face, graying beard, and eyes that shine. He was expounding on a page from the Koran, which lay open before him on a wooden stand, a pair of wire-rimmed glasses holding his place. Three other men, all advanced students, followed his every word. I took off my shoes and sat quietly on one of the mats that carpeted the dirt floor.

After the lesson I asked, “How is Jenne-jeno joined to Djénné?” I was worried he might take offense. After all, Djénné is a holy city. Jenne-jeno was inhabited by people some Muslims consider infidels. Bia Bia didn’t flinch. He explained that Djénné and Jenne-jeno are the same. The town grew and endured because of one thing, he said—connaissance.

“Djénné does not resemble any other town, because all depends on the degree of knowledge of the population. The town was founded by someone who had great connaissance. Those who came after him until today were all grand connoisseurs. There are different types of knowledge—that of books, herding, fishing, crafts. The knowledge is transmitted from generation to generation.

“There are changes—people leaving and strangers coming. That which does not change is the identity of the town. The people of Djénné remain the people of Djénné.”

DJÉNNÉ’S PEOPLE were sorely tested by the severe droughts of the 1970s and ’80s, when rice crops failed, herders lost animals, and fishermen left to go where catches were still plentiful. Today conditions remain arid, forcing many rice farmers to plant dryland crops such as millet and sorghum, but Djénné has returned to its ancient rhythms.

At twilight one day a tippy pirogue carried Moctar Cissé and me across a channel north of Djénné. A steady wind was blowing over the floodplain. The soft ground was impressed with the prints of birds and livestock and people. Pottery fragments were scattered about. In a gully lay the rotting bodies of a cow and a newborn calf.

We came to a village of plain rectangular mud houses. A few stood unfinished, like ruins. As the moon rose, bright enough to cast noontday shadows, the calves arrived, driven by children who yelled and laughed and chased each other. Each calf was tied to a stake. The cows followed from more distant pastures, dust billowing, as children tussled with the



MORE ON OUR WEBSITE

Find more photographs of Djénné and field notes from the coverage at nationalgeographic.com/ngm/0106.



HOLY GROUND

Tracing out a prayer, traditional healer Hamey Cissé consecrates dirt from the floor of the Great Mosque so that it can be worn in an amulet. "The clay of Djénné is blessed because there are benedictions in the earth," he explains. Though raised in Koranic schools (below), Djénné's people continue to honor pre-Islamic beliefs—that the land is sacred and a source of supernatural power.

long-horned animals. Moctar's nine-year-old brother, waving a stick half his height, shoved and swatted his family's cows. Then he and Moctar's father tethered each one to a stake for milking. For a time the only sounds were of bellowing and milk streaming into calabashes. Watching and listening, I thought how little had changed—it could have been a hundred years ago in Djénné, or a thousand.

Many fear that what I experienced is about to disappear. Returning to my hotel one day, I saw a crowd outside the House of the People. A hundred men sat in ranks on the ground. Others perched on windowsills or leaned against doorways. A reporter from the new local radio station held out a tape recorder to capture the proceedings inside—a series of speeches, each enthusiastically applauded.

"They have come from Bamako to report on the dam at Talo," said Moctar Cissé. "Everyone is against it."

Djénné's representatives were telling constituents about their fight to stop a proposed 8.5-million-dollar dam, approved over their objections in 1998. The deputies swore they would not let the project go ahead.

After the meeting I sought out Bagouro Noumansana, a retired agronomist and rural development expert, who is leading the opposition to the dam. "If they cut off the water, what can we do?" he said. "If the population cannot grow rice, cannot fish, cannot herd, they are going to go elsewhere to eat. Talo will be the death of Djénné."



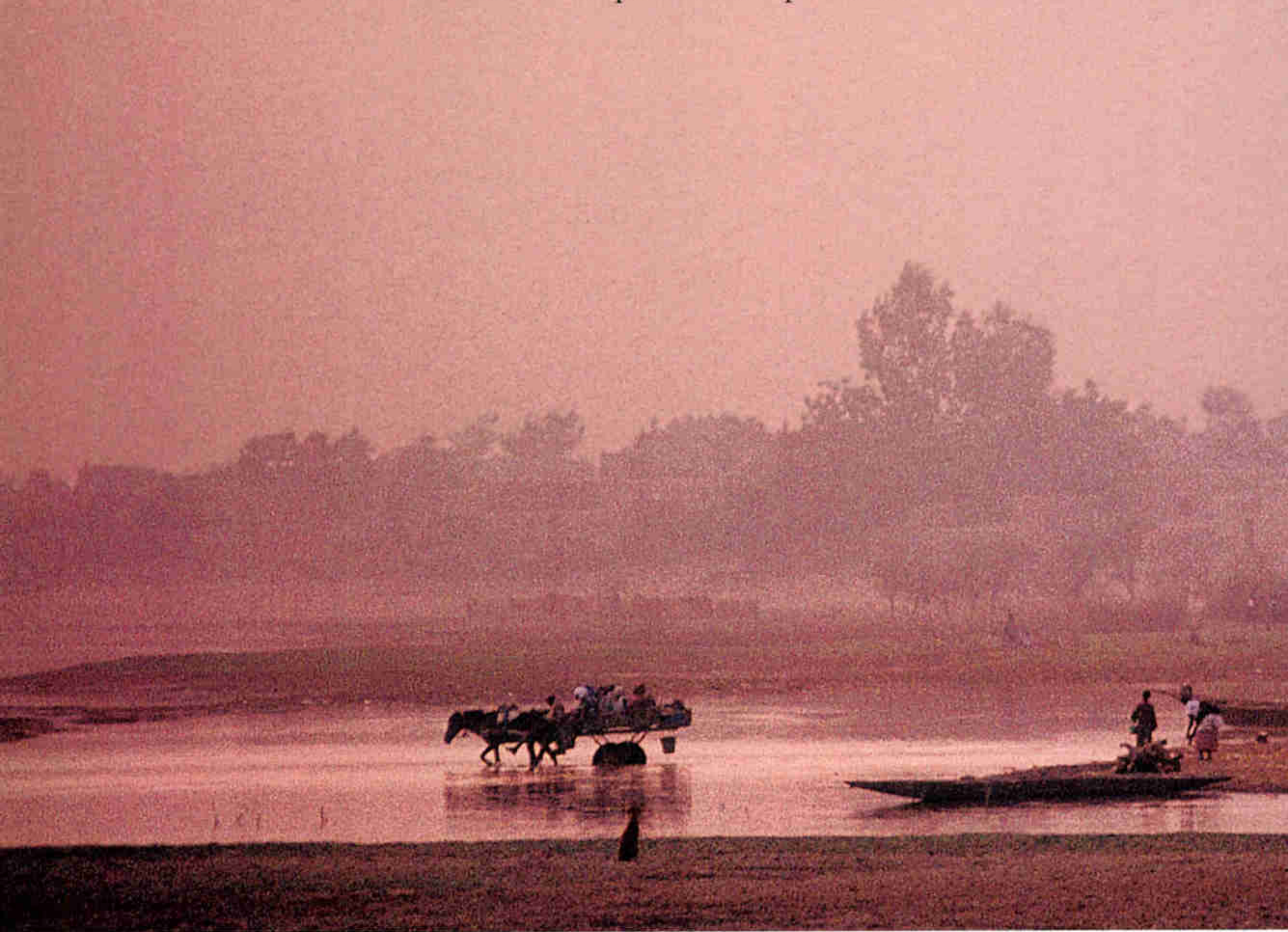
Oumar Maiga, a Djennenké who heads the government's agricultural extension effort in the region, said he warned his bosses that the benefits the dam would bring to Talo would be offset by a drop in rice, meat, and fish production in Djénné. They responded by promising money for farmers to pump water from the Bani into their fields.

"They are afraid," he said. "They know Djénné is a religious place." By that he meant a city whose leaders, in the ancient tradition of nyama, had supernatural powers. Then he shared a rumor: "The marabouts have already made a *malédiction* on the Talo dam," he said. "The person who lays the first stone will die."

Later, in Bamako, as I sat in the office of Askia Muhamed, press secretary for President Alpha Oumar Konaré, the threat seemed faintly ridiculous. Muhamed said the national interest must override the local. "Mali cannot feed itself," he said. "The priority is development. One cannot stop development, even to save the country's heritage."

Technicians at the Ministry of Rural Development said the Talo dam would cause only a slight decrease in the amount of water reaching Djénné and that it would ensure the Bani flowed year-round, rather than shrinking to almost nothing in the dry season.

In Djénné such assurances are greeted with the skepticism people in rural areas the world over reserve for plans from capital cities.



BEYOND TIME

A cart sets out across the receding waters of the Bani, bearing goods away from Djénné's market in a scene repeated countless times since the city's founding about A.D. 1000. Outlasting kingdoms and empires, Djénné remains, a city of earth and human spirit.

Despite their opposition, the government plans to begin construction this year and to complete the dam in 2003. In future years floods will be slower in coming and smaller. I think of Moctar Cissé's family and the 20,000 other Djennenké, eking out their ancestral livings. After century upon century will it all come to an end? And what will be left of Djénné? An artificial city of buildings restored for tourists?

I remember the words of a young marabout, Thoukiri Samanaye. When I asked what would become of the city, he brought out an old handwritten book, filled with designs like the ones on the pottery from the earliest days of Djénné. He stopped at one—a grid like a ticktacktoe board that he said was a means of seeing the future—and copied it onto a piece of paper, carefully placing Arabic letters in each of its squares. Then he spoke, as though the time to come hung in the air before him.

“Many say Djénné is going to lose its value, that people are going to leave. But Djénné will be well inhabited as before. Djénné of the future is Djénné of the past.”

At first the prediction struck me as wishful thinking. But now I realize how true it is. Djénné's future—its survival—depends on its ability to hold to the essentials of its past. It adapts to changing circumstances while guarding what lasts. This is the city's ultimate power, its nyama, if you will—that it endures. □



**Just another Midsummer
Eve on Eaglesham Way,
aka Friend Street to
neighborhood kids.**



27513



Suburbia Unbound

BY JOEL BOURNE, JR.
NATIONAL GEOGRAPHIC EDITORIAL STAFF

PHOTOGRAPHS BY SCOTT LEWIS



You just can't shoot your cannon off like you used to in Cary, bemoans Charles Dreher, Sr., a Civil War buff who owns a cherished artillery piece. "I fired it straight across the road up until ten or twelve years ago when they built the houses over there. I still fire it down High House Road now and then. But if I see headlights, I hold off."

The problem for Dreher is that the number of headlights has exploded in recent years. Located next to Research Triangle Park, North Carolina's booming high-tech business center situated between Raleigh, Durham, and Chapel Hill, the once rural community has become one of the fastest growing and most affluent areas in the state, its population doubling every decade since 1960. With some 96,000 residents, split primarily between two sprawling zip codes that cover nearly 50 square miles, the officially named Town of Cary eclipsed Chapel Hill in 1990 as the third largest city in the Triangle, the seventh largest in the state.

Most newcomers have moved from northern cities, leading many locals to jest that Cary stands for Containment Area for Relocated Yankees. Ironically, the town was named for a Yankee: Samuel F. Cary, an impassioned Union supporter and temperance leader from Ohio who is said to have delivered one of his fiery sermons here in the 1850s.

"You have to teach 'em how to say KERRY instead of KAHRY," says homebuilder Bob Godbold with a laugh, after polishing off his lunch at Melba's Country Kitchen—a diner where old Cary gathers. "Cary was one square mile for years," says Godbold, 66, who was born and raised here. "Started as a pulpwood town. It's gone from logs to logic now."

27513

POPULATION IN 1990:

15,767

POPULATION IN 2000:

40,116

INCREASE IN AVERAGE INCOME BETWEEN 1990 AND 2000: 67%**RESIDENTS WITH WHITE-COLLAR JOBS:** 81%**MEDIAN PROPERTY****VALUE:** \$154,347**HOUSEHOLDS MADE UP OF A MARRIED COUPLE****WITH CHILDREN:** 89%**NUMBER OF STOPLIGHTS****IN CARY IN 1960:** 1**NUMBER OF STOPLIGHTS****IN CARY IN 2000:** 100

Sunset Strip, Cary style. Cary is among the fastest growing towns in North Carolina.





Rolling red clay tobacco fields and loblolly pine forests have given way to sweeping new subdivisions and brick-fronted shopping centers that look remarkably similar. The town's largest employers now include IBM, Cisco Systems, Lucent Technology, and SAS Institute, whose world headquarters occupies a 500-acre campus on the edge of town. Named for the Statistical Analysis System its founders developed at nearby North Carolina State University to analyze agricultural data, SAS produces software that scans oceans of information to find relevant patterns and meaning. Its uses now range from developing new drugs to calculating the consumer price index of the United States.

"SAS Institute mirrors Cary and Cary mirrors SAS," says Koka Booth, a former mayor who works for the software giant. The average age in Cary is 33, the average SAS employee is 35. The median household income in Cary is about \$60,000, the average salary at SAS is \$60,000. Striding the hushed corridors adorned with modern art, Booth reels off a laundry list of employee benefits—from on-site day care to belly dancing lessons at lunch—that have led various business magazines to rate SAS, and in turn Cary, one of the best places to live and work in the country.

The symbiosis between the company and the community extends beyond the front gate. Jim Goodnight, SAS co-founder and CEO, bankrolled the town's largest developer, who built subdivision after upscale subdivision. Just as every employee works in a 10-foot by 12-foot office,

Women of the Wessex subdivision don tiaras at bunco princess night, a mix of dice game and costume party where moms can let their hair down.

nearly everyone in the 27513 zip code lives in a “five, four, and a door”—a two-story colonial with five windows across the top and two windows on either side of the entrance. Fifteen percent of all households include someone with an advanced degree. The crime rate is among the state’s lowest for cities of its size. Cary resembles a futuristic Pleasantville.

Or at least it did. In recent years cracks have been appearing in the town’s appealing facade. Commute times to Research Triangle Park have almost doubled, some to nearly an hour. Classrooms overflowed until 20 percent of students were attending class in trailers. Even Goodnight, who occasionally walks to work from his home on the SAS campus, has noticed a decline in the town’s vaunted quality of life.

“Most of the residents feel the same way I feel,” says the silver-maned Goodnight. “The roads are choked, the schools are choked. We’ve got enough people here.”

Frustration with traffic and crowded schools led to the 1999 election of Mayor Glen Lang, a 43-year-old software millionaire who felt it was high time for a slow-growth initiative. Since taking office, Lang has been widening roads, improving schools, and preaching the mantra of diversity—particularly housing that would attract seniors and young adults. A native of La Crosse, Wisconsin, Lang’s confrontational style ruffled a few feathers among the Southerners who ran city hall for years. His opponent in the mayor’s race even called him blunt, which still makes Lang grin. “Where I come from being blunt is not necessarily a bad thing,” Lang says in a staccato burst. “Look at Southern literature. There is a fatalism there. If you assume there will be traffic, there will be traffic! I’m a Silicon Valley businessman. I don’t see problems; I see opportunities!”

Despite its growing pains, optimism abounds in the big small town, especially among the newer residents who have left blizzards and two-hour commutes behind. “I came kicking and screaming,” says one recent convert, who moved with her husband, an IBM employee, from a tony Chicago suburb two years ago. “Now we’ve fallen in love with it.”

But what makes Cary so lovable?

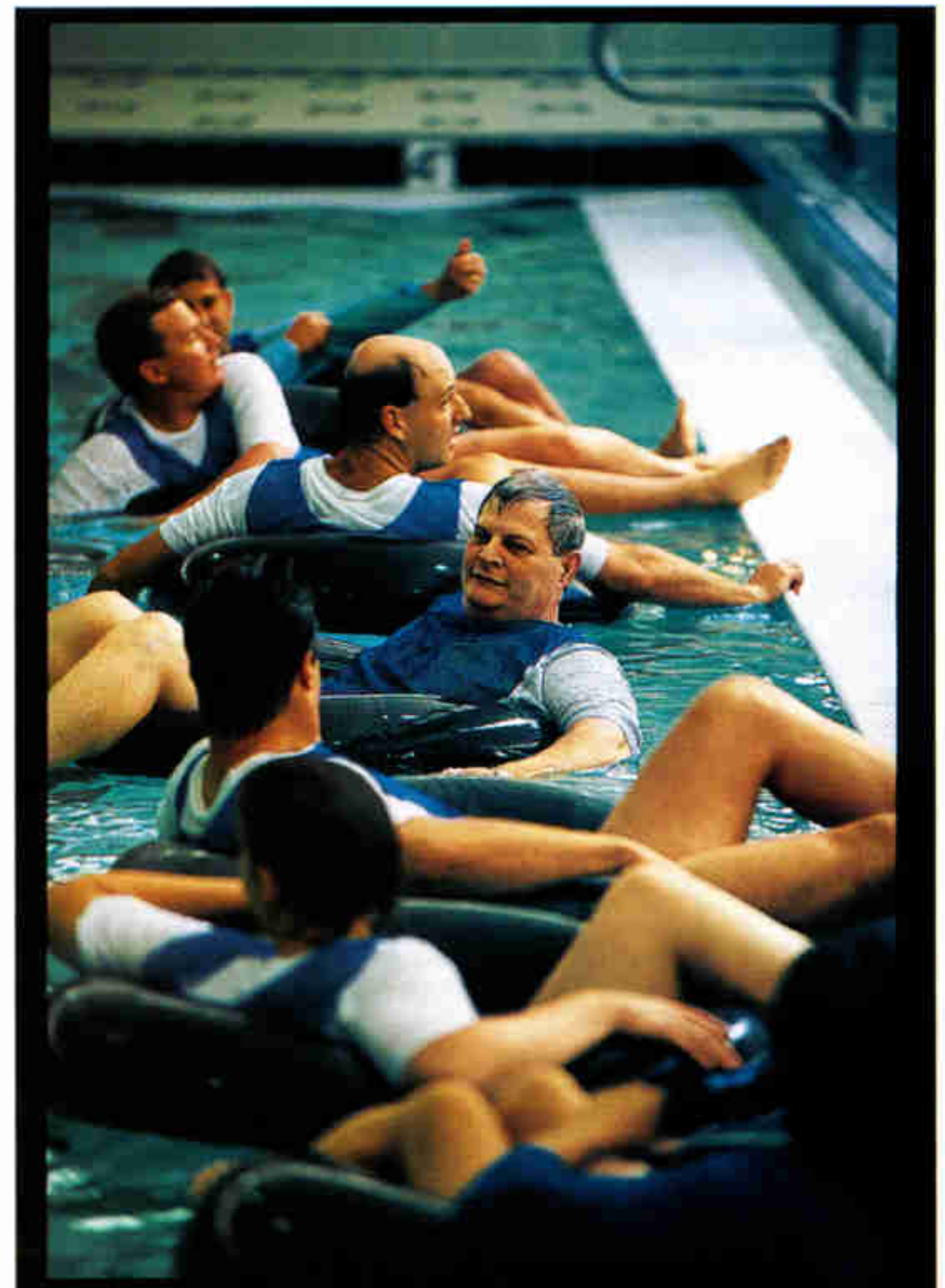
“The weather, of course,” she says. “And I like the pace of life here. It’s not the big city with all the stress. It’s a very friendly community.” Just the other day a neighbor called and wanted her to play bunco, a popular dice game. “My first reaction was, I don’t do bunco anymore. It’s a mindless game, an excuse for all the women in the neighborhood to get out and have a ladies’ night.” Her crimson lips crack into a conspiratorial grin. “They’re coming to my house next Thursday! I’ve already got my menu planned! Usually there’s a theme. . . . I’m passing out tiaras and magic wands they can use to keep score. It’ll be bunco princess night! Lots of wine! Lots of fun!”

And somewhere in a cold Ohio cemetery, Samuel F. Cary is rolling in his grave. □

MORE INFORMATION

ON OUR WEBSITE There’s more on 27513 at nationalgeographic.com/ngm/0106. Tell us why we should cover **YOUR FAVORITE ZIP CODE** at nationalgeographic.com/ngm/zipcode/0106, or mail your suggestion to PO Box 96095, Washington, DC 20090-6095. E-mail: zip@nationalgeographic.com

Employees break for inner-tube water polo at software giant SAS Institute’s world headquarters.



Final Edit



DJÉNNÉ

Team Spirit

Paddles send water flying as men drive to win a canoe race near Djénné on Mali's Independence Day, September 22. Photographer Sarah Leen got the shot by renting a small outboard and drawing in as close as she dared: "They were paddling so fast and with such spirit; you wanted to get the picture but not get in the way—God forbid, they'd kill you." Leen had only a short time to photograph before judges, concerned about her boat's wake, ordered her to the back of the race. Leen likens the contest—the high point of Djénné's most important secular holiday—to the Super Bowl. "It was a big deal. It was very competitive." Yet the picture also reflects daily life around Djénné, which much of the year is surrounded by the floodwaters of the Bani. "The races stem from a tradition of using the river as a highway," Leen says.

MORE ON OUR WEBSITE

You can send this picture as an electronic greeting card at nationalgeographic.com/ngm/0106.

Celebrate



Ann, Arthritic Shoulder.*

*Individual results may vary.



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200 mg

BRIEF SUMMARY—CELEBREX® (celecoxib capsules)

Before prescribing, please consult complete prescribing information.

INDICATIONS AND USAGE

For relief of the signs and symptoms of OA, and of RA in adults.

CONTRAINDICATIONS

CELEBREX is contraindicated in patients with known hypersensitivity to celecoxib. CELEBREX should not be given to patients who have demonstrated allergic-type reactions to sulfonamides. CELEBREX should not be given to patients who have experienced asthma, urticaria, or allergic-type reactions after taking aspirin or other NSAIDs. Severe, rarely fatal, anaphylactic-like reactions to NSAIDs have been reported in such patients (see WARNINGS — Anaphylactoid Reactions, and PRECAUTIONS — Preexisting Asthma).

WARNINGS

Gastrointestinal (GI) Effects — Risk of GI Ulceration, Bleeding, and Perforation: Serious GI toxicity such as bleeding, ulceration, and perforation of the stomach, small intestine or large intestine, can occur at any time, with or without warning symptoms, in patients treated with NSAIDs. Minor upper GI problems, such as dyspepsia, are common and may also occur at any time during NSAID therapy. Therefore, physicians and patients should remain alert for ulceration and bleeding, even in the absence of previous GI tract symptoms. Patients should be informed about the signs and/or symptoms of serious GI toxicity and the steps to take if they occur. Only 1/5 patients who develop a serious upper GI adverse event on NSAID therapy is symptomatic. Upper GI ulcers, gross bleeding or perforation, caused by NSAIDs, appear to occur in approximately 1% of patients treated for 3–6 months, and in about 2–4% of patients treated for one year. These trends continue thus, increasing the likelihood of developing a serious GI event at some time during the course of therapy. However, even short-term therapy is not without risk. It is unclear, at the present time, how the above rates apply to CELEBREX (see CLINICAL STUDIES — Special Studies in the complete prescribing information). Among 5,285 patients who received CELEBREX in controlled clinical trials of 1 to 6 months duration (most were 3 month studies) at a daily dose of 200 mg or more, 2 (0.04%) experienced significant upper GI bleeding, at 14 and 22 days after initiation of dosing. Approximately 40% of these 5,285 patients were in studies that required them to be free of ulcers by endoscopy at study entry. Thus it is unclear if this study population is representative of the general population. Prospective, long-term studies required to compare the incidence of serious, clinically significant upper GI adverse events in patients taking CELEBREX vs. comparator NSAID products have not been performed. NSAIDs should be prescribed with extreme caution in patients with a prior history of ulcer disease or GI bleeding. Most spontaneous reports of fatal GI events are in elderly or debilitated patients and therefore special care should be taken in treating this population. **To minimize the potential risk for an adverse GI event, the lowest effective dose should be used for the shortest possible duration.** For high risk patients, alternate therapies that do not involve NSAIDs should be considered. Studies have shown that patients with a prior history of peptic ulcer disease and/or GI bleeding and who use NSAIDs, have a greater than 10-fold higher risk for developing a GI bleed than patients with neither of these risk factors. In addition to a past history of ulcer disease, pharmacoepidemiological studies have identified several other co-therapies or co-morbid conditions that may increase the risk for GI bleeding such as: treatment with oral corticosteroids, treatment with anticoagulants, longer duration of NSAID therapy, smoking, alcoholism, older age, and poor general health status.

Anaphylactoid Reactions: As with NSAIDs in general, anaphylactoid reactions have occurred in patients without known prior exposure to CELEBREX. In post-marketing experience, rare cases of anaphylactic reactions and angioedema have been reported in patients receiving CELEBREX. CELEBREX should not be given to patients with the aspirin triad. This symptom complex typically occurs in asthmatic patients who experience rhinitis with or without nasal polyps, or who exhibit severe, potentially fatal bronchospasm after taking aspirin or other NSAIDs (see CONTRAINDICATIONS and PRECAUTIONS — Preexisting Asthma). Emergency help should be sought in cases where an anaphylactoid reaction occurs.

Advanced Renal Disease: Treatment with CELEBREX is not recommended.

Pregnancy: In late pregnancy CELEBREX should be avoided because it may cause premature closure of the ductus arteriosus.

PRECAUTIONS

General: CELEBREX cannot be expected to substitute for corticosteroids or to treat corticosteroid insufficiency. The pharmacological activity of CELEBREX in reducing inflammation, and possibly fever, may diminish the utility of these diagnostic signs in detecting infectious complications of presumed noninfectious, painful conditions.

Hepatic Effects: Borderline elevations of one or more liver tests may occur in up to 15% of patients taking NSAIDs, and notable elevations of ALT or AST (approximately three or more times the upper limit of normal) have been reported in approximately 1% of patients in clinical trials with NSAIDs. These laboratory abnormalities may progress, may remain unchanged, or may be transient with continuing therapy. Rare cases of severe hepatic reactions, including jaundice and fatal fulminant hepatitis, liver necrosis and hepatic failure (some with fatal outcome) have been reported with NSAIDs, including CELEBREX. (See ADVERSE REACTIONS — post-marketing experience.) In controlled clinical trials of CELEBREX, the incidence of borderline elevations of liver tests was 6% for CELEBREX and 5% for placebo, and approximately 0.2% of patients taking CELEBREX and 0.3% of patients taking placebo had notable elevations of ALT and AST. A patient with symptoms and/or signs suggesting liver dysfunction, or in whom an abnormal liver test has occurred, should be monitored carefully for evidence of the development of a more severe hepatic reaction while on therapy with CELEBREX. If clinical signs and symptoms consistent with liver disease develop, or if systemic manifestations occur (e.g., eosinophilia, rash, etc.), CELEBREX should be discontinued.

Renal Effects: Long-term administration of NSAIDs has resulted in renal papillary necrosis and other renal injury. Renal toxicity has also been seen in patients in whom renal prostaglandins have a compensatory role in the maintenance of renal perfusion. In these patients, administration of an NSAID may cause a dose-dependent reduction in prostaglandin formation and, secondarily, in renal blood flow, which may precipitate overt renal decompensation. Patients at greatest risk of this reaction are those with impaired renal function, heart failure, or liver dysfunction, those taking diuretics and ACE inhibitors, and the elderly. Discontinuation of NSAID therapy is usually followed by recovery to the pretreatment state. Clinical trials with CELEBREX have shown renal effects similar to those observed with comparator NSAIDs. Caution should be used when initiating treatment with CELEBREX in patients with considerable dehydration. It is advisable to rehydrate

patients first and then start therapy with CELEBREX. Caution is also recommended in patients with pre-existing kidney disease (see WARNINGS — Advanced Renal Disease).

Hematological Effects: Anemia may occur. In controlled clinical trials the incidence of anemia was 0.6% with CELEBREX and 0.4% with placebo. Patients on long-term treatment with CELEBREX should have their hemoglobin or hematocrit checked if they exhibit any signs or symptoms of anemia or blood loss. CELEBREX does not generally affect platelet counts, prothrombin time (PT), or partial thromboplastin time (PTT), and does not appear to inhibit platelet aggregation at indicated dosages (See CLINICAL STUDIES — Special Studies — Platelets in the complete prescribing information).

Fluid Retention and Edema: Fluid retention and edema may occur (see ADVERSE REACTIONS). Therefore, CELEBREX should be used with caution in patients with fluid retention, hypertension, or heart failure.

Preexisting Asthma: Do not use in patients with aspirin-sensitive asthma because of the risk of severe bronchospasm. Use with caution in patients with preexisting asthma.

Laboratory Tests: Because serious GI tract ulcerations and bleeding can occur without warning symptoms, physicians should monitor for signs or symptoms of GI bleeding. During the controlled clinical trials, there was an increased incidence of hyperchloremia in patients receiving celecoxib compared with patients on placebo. Other laboratory abnormalities that occurred more frequently in the patients receiving celecoxib included hypophosphatemia, and elevated BUN. These laboratory abnormalities were also seen in patients who received comparator NSAIDs in these studies. The clinical significance of these abnormalities has not been established.

Drug Interactions: General: Celecoxib metabolism is predominantly mediated via cytochrome P450 2C9 in the liver. Co-administration of celecoxib with drugs that are known to inhibit 2C9 should be done with caution. *In vitro* studies indicate that celecoxib, although not a substrate, is an inhibitor of cytochrome P450 2D6. Therefore, there is a potential for an *in vivo* drug interaction with drugs that are metabolized by P450 2D6. **ACE-inhibitors:** Reports suggest that NSAIDs may diminish the antihypertensive effect of Angiotensin Converting Enzyme (ACE) inhibitors. This interaction should be given consideration in patients taking CELEBREX concomitantly with ACE-inhibitors. **Furosemide:** Clinical studies, as well as post marketing observations, have shown that NSAIDs can reduce the natriuretic effect of furosemide and thiazides in some patients. This response has been attributed to inhibition of renal prostaglandin synthesis. **Aspirin:** CELEBREX can be used with low dose aspirin. However, concomitant administration of aspirin with CELEBREX may result in an increased rate of GI ulceration or other complications, compared to use of CELEBREX alone (see CLINICAL STUDIES — Special Studies — Gastrointestinal in the complete prescribing information). Because of its lack of platelet effects, CELEBREX is not a substitute for aspirin for cardiovascular prophylaxis. **Fluconazole:** Concomitant administration of fluconazole at 200 mg QD resulted in a two-fold increase in celecoxib plasma concentration. This increase is due to the inhibition of celecoxib metabolism via P450 2C9 by fluconazole (see Pharmacokinetics — Metabolism). CELEBREX should be introduced at the lowest recommended dose in patients receiving fluconazole. **Lithium:** In a study conducted in healthy subjects, mean steady-state lithium plasma levels increased approximately 17% in subjects receiving lithium 450 mg BID with CELEBREX 200 mg BID as compared to subjects receiving lithium alone. Patients on lithium treatment should be closely monitored when CELEBREX is introduced or withdrawn. **Methotrexate:** In an interaction study of rheumatoid arthritis patients taking methotrexate, CELEBREX did not have a significant effect on the pharmacokinetics of methotrexate. **Warfarin:** Anticoagulant activity should be monitored, particularly in the first few days, after initiating or changing CELEBREX therapy in patients receiving warfarin or similar agents, since these patients are at an increased risk of bleeding complications. The effect of celecoxib on the anticoagulant effect of warfarin was studied in a group of healthy subjects receiving daily doses of 2–5 mg of warfarin. In these subjects, celecoxib did not alter the anticoagulant effect of warfarin as determined by prothrombin time. However, in post-marketing experience, bleeding events have been reported, predominantly in the elderly, in association with increases in prothrombin time in patients receiving CELEBREX concurrently with warfarin. **Carcinogenesis, mutagenesis, impairment of fertility:** Celecoxib was not carcinogenic in rats given oral doses up to 200 mg/kg for males and 10 mg/kg for females (approximately 2- to 4-fold the human exposure as measured by the AUC₀₋₂₄ at 200 mg BID) or in mice given oral doses up to 25 mg/kg for males and 50 mg/kg for females (approximately equal to human exposure as measured by the AUC₀₋₂₄ at 200 mg BID) for two years. Celecoxib was not mutagenic in an Ames test and a mutation assay in Chinese hamster ovary (CHO) cells, nor clastogenic in a chromosome aberration assay in CHO cells and an *in vivo* micronucleus test in rat bone marrow. Celecoxib did not impair male and female fertility in rats at oral doses up to 600 mg/kg/day (approximately 11-fold human exposure at 200 mg BID based on the AUC₀₋₂₄).

Pregnancy: Teratogenic effects: Pregnancy Category C. Celecoxib was not teratogenic in rabbits up to an oral dose of 60 mg/kg/day (equal to human exposure at 200 mg BID as measured by AUC₀₋₂₄); however, at oral doses \geq 150 mg/kg/day (approximately 2-fold human exposure at 200 mg BID as measured by AUC₀₋₂₄), an increased incidence of fetal alterations, such as ribs fused, sternbrae fused and sternbrae misshapen, was observed. A dose-dependent increase in diaphragmatic hernias was observed in one of two rat studies at oral doses \geq 30 mg/kg/day (approximately 6-fold human exposure based on the AUC₀₋₂₄ at 200 mg BID). There are no studies in pregnant women. CELEBREX should be used during pregnancy only if the potential benefit justifies the potential risk to the fetus. **Nonteratogenic effects:** Celecoxib produced preimplantation and post-implantation losses and reduced embryo/fetal survival in rats at oral dosages \geq 50 mg/kg/day (approximately 6-fold human exposure based on the AUC₀₋₂₄ at 200 mg BID). These changes are expected with inhibition of prostaglandin synthesis and are not the result of permanent alteration of female reproductive function, nor are they expected at clinical exposures. No studies have been conducted to evaluate the effect of celecoxib on the closure of the ductus arteriosus in humans. Therefore, use of CELEBREX during the third trimester of pregnancy should be avoided. **Labor and delivery:** Celecoxib produced no evidence of delayed labor or parturition at oral doses up to 100 mg/kg in rats (approximately 7-fold human exposure as measured by the AUC₀₋₂₄ at 200 mg BID). The effects of CELEBREX on labor and delivery in pregnant women are unknown. **Nursing mothers:** It is not known whether this drug is excreted in human milk. Because many drugs are excreted in human milk and because of the potential for serious adverse reactions in nursing infants from CELEBREX, a decision should be made whether to discontinue nursing or to discontinue the drug, taking into account the importance of the drug to the mother.



CELEBREX® (celecoxib capsules)

Pediatric Use: Safety and effectiveness in pediatric patients below the age of 18 years have not been evaluated.

Geriatric Use: Of the total number of patients who received CELEBREX in clinical trials, more than 2,100 were 65–74 years of age, while approximately 800 additional patients were 75 years and over. While the incidence of adverse experiences tended to be higher in elderly patients, no substantial differences in safety and effectiveness were observed between these subjects and younger subjects. Other reported clinical experience has not identified differences in response between the elderly and younger patients, but greater sensitivity of some older individuals cannot be ruled out. In clinical studies comparing renal function as measured by the GFR, BUN and creatinine, and platelet function as measured by bleeding time and platelet aggregation, the results were not different between elderly and young volunteers.

ADVERSE REACTIONS

Adverse events occurring in ≥ 2% of Celebrex patients from controlled arthritis trials, regardless of causality at recommended doses (N=4146): abdominal pain 4.1%, diarrhea 5.6%, dyspepsia 8.8%, flatulence 2.2%, nausea 3.5%, back pain 2.8%, peripheral edema 2.1%, injury-accidental 2.9%, dizziness 2.0%, headache 15.8%, insomnia 2.3%, pharyngitis 2.3%, rhinitis 2.0%, sinusitis 5.0%, upper respiratory tract infection 8.1%, rash 2.2%. In placebo- or active-controlled clinical trials, the discontinuation rate due to adverse events was 7.1% for patients receiving CELEBREX and 6.1% for patients receiving placebo. Among the most common reasons for discontinuation due to adverse events in the CELEBREX treatment groups were dyspepsia and abdominal pain (cited as reasons for discontinuation in 0.8% and 0.7% of CELEBREX patients, respectively). Among patients receiving placebo, 0.6% discontinued due to dyspepsia and 0.6% withdrew due to abdominal pain. The following adverse events occurred in 0.1–1.9% of patients regardless of causality.

Celebrex (100–200 mg BID or 200 mg QD): GI: Constipation, diverticulitis, dysphagia, eructation, esophagitis, gastritis, gastroenteritis, gastroesophageal reflux, hemorrhoids, hiatal hernia, melena, dry mouth, stomatitis, tenesmus, tooth disorder, vomiting; **Cardiovascular:** Aggravated hypertension, angina pectoris, coronary artery disorder, myocardial infarction; **General:** Allergy aggravated, allergic reaction, asthenia, chest pain, cyst NOS, edema generalized, face edema, fatigue, fever, hot flushes, influenza-like symptoms, pain, peripheral pain; **Resistance mechanism disorders:** Herpes simplex, herpes zoster, infection bacterial, infection fungal, infection soft tissue, infection viral, moniliasis, moniliasis genital, otitis media; **Central, peripheral nervous system:** Leg cramps, hypertonia, hypoesthesia, migraine, neuralgia, neuropathy, paresthesia, vertigo; **Female reproductive:** Breast fibroadenosis, breast neoplasm, breast pain, dysmenorrhea, menstrual disorder, vaginal hemorrhage, vaginitis; **Male reproductive:** Prostatic disorder; **Hearing and vestibular:** Deafness, ear abnormality, earache, tinnitus; **Heart rate and rhythm:** Palpitation, tachycardia; **Liver and biliary system:** Hepatic function abnormal, SGOT increased, SGPT increased; **Metabolic and nutritional:** BUN increased, CPK increased, diabetes mellitus, hypercholesterolemia, hyperglycemia, hypokalemia, NPN increase, creatinine increased, alkaline phosphatase increased, weight increase; **Musculoskeletal:** Arthralgia, arthrosis, bone disorder, fracture accidental, myalgia, neck stiffness, synovitis, tendinitis; **Platelets (bleeding or clotting):** Ecchymosis, epistaxis, thrombocytopenia; **Psychiatric:** Anorexia, anxiety, appetite increased, depression, nervousness, somnolence; **Hemic:** Anemia; **Respiratory:** Bronchitis, bronchospasm, bronchospasm aggravated, coughing, dyspnea, laryngitis, pneumonia; **Skin and appendages:** Alopecia, dermatitis, nail disorder, photosensitivity reaction, pruritus, rash erythematous, rash maculopapular, skin disorder, skin dry, sweating increased, urticaria; **Application site disorders:** Cellulitis, dermatitis contact, injection site reaction, skin nodule; **Special senses:** Taste perversion; **Urinary system:** Albuminuria, cystitis, dysuria, hematuria, micturition frequency, renal calculus, urinary incontinence, urinary tract infection; **Vision:** Blurred vision, cataract, conjunctivitis, eye pain, glaucoma.

Other serious adverse reactions which occur rarely (estimated < 0.1%), regardless of causality: The following serious adverse events have occurred rarely in patients taking CELEBREX. Cases reported only in the post-marketing experience are indicated in italics. **Cardiovascular:** Syncope, congestive heart failure, ventricular fibrillation, pulmonary embolism, cerebrovascular accident, peripheral gangrene, thrombophlebitis, *vasculitis*; **GI:** Intestinal obstruction, intestinal perforation, gastrointestinal bleeding, colitis with bleeding, esophageal perforation, pancreatitis, ileus; **Liver and biliary system:** Cholelithiasis, *hepatitis, jaundice, liver failure*; **Hemic and lymphatic:** Thrombocytopenia, *agranulocytosis, aplastic anemia, pancytopenia, leukopenia*; **Metabolic:** *Hypoglycemia*; **Nervous system:** Ataxia, suicide; **Renal:** Acute renal failure, *interstitial nephritis*; **Skin:** *Erythema multiforme, exfoliative dermatitis, Stevens-Johnson syndrome, toxic epidermal necrolysis*; **General:** Sepsis, sudden death, *anaphylactoid reaction, angioedema*.

OVERDOSAGE

Symptoms following acute NSAID overdoses are usually limited to lethargy, drowsiness, nausea, vomiting, and epigastric pain, which are generally reversible with supportive care. GI bleeding can occur. Hypertension, acute renal failure, respiratory depression and coma may occur, but are rare. Anaphylactoid reactions have been reported with therapeutic ingestion of NSAIDs, and may occur following an overdose. Patients should be managed by symptomatic and supportive care following an NSAID overdose. There are no specific antidotes. No information is available regarding the removal of celecoxib by hemodialysis, but based on its high degree of plasma protein binding (> 97%) dialysis is unlikely to be useful in overdose. Emesis and/or activated charcoal (60 to 100 g in adults, 1 to 2 g/kg in children) and/or osmotic cathartic may be indicated in patients seen within 4 hours of ingestion with symptoms or following a large overdose. Forced diuresis, alkalization of urine, hemodialysis, or hemoperfusion may not be useful due to high protein binding.



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WALES

Facing Fear

A magazine team digs deep and finds that coal mining creates a special set of terrors

Blinking “like moles brought up from underground,” photographer **Vince Musi**, at left, and author **Simon Worrall**, at right, emerge from an unsettling tour of Tower Colliery in Hirwaun, the last operating deep coal mine in Wales. Martin Broome, center, the mine’s safety official, led the team four and a half miles below ground on a morning-long journey that “seemed like an eternity,” Simon says. After a bone-jangling descent in an elevator cage, the trio walked down a sloping tunnel to a conveyor belt on steel rollers. “We’ll travel on this,” Martin said, and so they lay down on the belt on their bellies for a harrowing seven-minute ride. “That’s a lot of time to think,” Simon notes. “It starts with a bang, there’s nothing smooth about it, and it goes 15 miles an hour. All I could see was the soles of Martin’s boots. I tried to stay calm, but I was scared.”

At the coal face the team encountered an intense hot wind, confined space, and “an awesome coal-cutting machine with tungsten-steel bits.” Martin led them down a long tunnel to an area where methane gas is vented. “That was when I was ready to get out,” Simon says. “We were humbled to think that people do this every day.”

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DJÉNNÉ

Household Helper

Putting herself to work, staff writer **Karen Lange**, at right, rinses the breakfast dishes after spending the night in Aissata Sow's traditional mud-brick house. Sow rose at 3 a.m. to begin the day's chores by doing laundry. Though her family is middle-class by Mali standards, her house lacks electricity and running water. "I was trying to be helpful," says Karen, who was making a return visit to Djénné. She first went to see its famed architecture in 1986 after completing a two-year stint with the Peace Corps in Liberia.



SARAH LEEN

WORLDWIDE

Photographic engineers **Joseph Stancampiano** (below, right) and **Keith Moorehead** display tools of the underwater photography trade they used to support our photographers working at the U.S.S. *Arizona*. Keith holds a digital still camera in an underwater housing; Joe carries a laptop computer that stores remote images the camera made inside the ship. "In terms of diving, this was easy," says Joe. "It's shallow, the water's not cold, nothing's trying to eat you. But visibility was awful." And diving to the *Arizona* was emotionally



DAVID DOUBILET

taxing: "You feel like you're treading on someone's grave. This is a sacred place."

Mattias Klum found himself constantly alert during the three months he spent tracking the Asiatic lions of Gir. "The teak forest is dense, dry; it's as if you are walking on cornflakes," says the Swedish photographer. "These are huge cats; you're a snack to them if you end up doing the wrong thing." Mattias and his wife, Monika, began the Asiatic Lion Fund (asiaticlionfund.org) to help support lion research and conservation projects.

A University of Texas course taught by GEOGRAPHIC contributor Maggie Steber propelled **Scott Lewis** toward a career in photojournalism. "She showed me what could be done with a camera, and she taught me that it was all about the people whose stories you're telling, not your ego," Scott says. Cary, North Carolina, is right down the road from his base as a photographer

in the Durham bureau of the *Raleigh News & Observer*.

Staff writer **Joel Bourne** knew Cary from his days as a student at North Carolina State University. On his zigzag route to the GEOGRAPHIC, Joel crewed on a tall ship from Honolulu to Sydney, worked on cattle stations in Australia, circumnavigated a Chilean peak, and has written and edited for magazines from the *Flue-Cured Tobacco Farmer* to *Audubon*.

The fractured foot **Carsten Peter** suffered in Chile was nothing new for the longtime adventurer: He's been injured motorcycling, skiing, paragliding, and kayaking. The kayaking mishap occurred three months after the paragliding accident, landing him in the same hospital: "They looked at me and said, 'You again?'"

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Flashback



A. W. CUTLER

WALES

A Novel Holiday

The waters of Conwy Bay could not compete with a couple's beach reading on the "sands"—as the photographer called them—at Penmaenmawr, North Wales.

This photograph was probably purchased for the article "A Short Visit to Wales," published in December 1923. In it, author Ralph A. Graves attributed the unwillingness of certain tourists to visit Wales, "one of the most alluring regions of the British Isles," to pronunciation problems. "The average American traveler," he wrote, "lacks the courage to wrestle with such place names as Bettws-y-Coed, Bodelwyddan, Dwygyfylchi, Clwyd, Llandudno, Pwllheli, and Pen-y-Gwryd."

This photograph has never before been published in the magazine.

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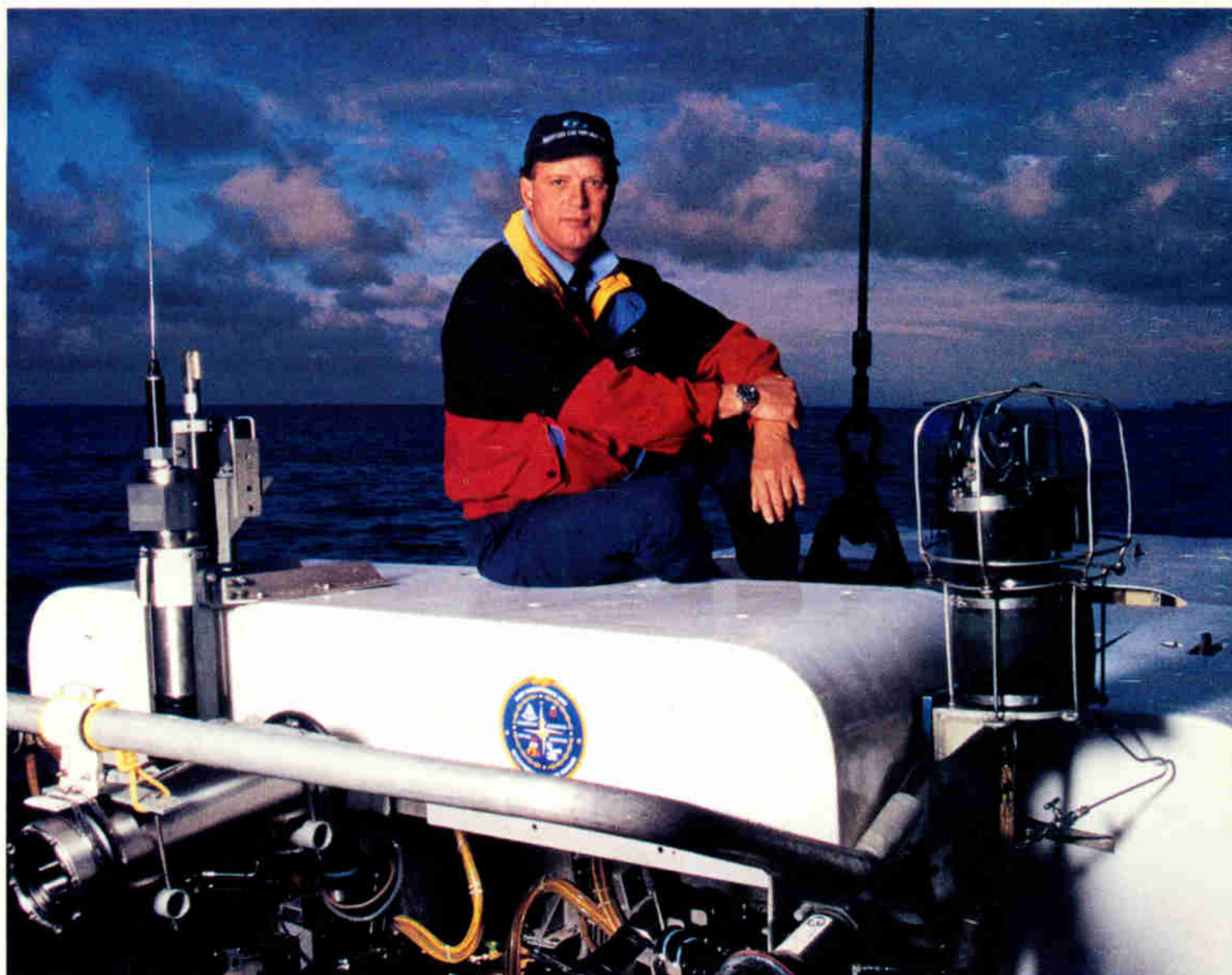
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Dr. Ballard, during an expedition in the Pacific, atop the ATV (Advanced Tethered Vehicle) Using remote controlled vehicles and submarines, Dr. Ballard has found, among others, the *Titanic*, the *Bismarck*, and ancient shipwrecks. His favorite piece of oceanographic equipment, however, is his Rolex Submariner.




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